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* General studies, see also individual crops.

Plant Breeding Abstracts

Vol. XV, No. 3

Part I. Empire Section

*STATISTICS 519

789. GOULDEN, C. H. 519:24:631.421
A uniform method of analysis for square lattice experiments.
Sci. Agric. 1944 : 25 : 115-36.

The fundamental characters of square lattice designs are discussed; a generalized method of analysis is presented for all such designs. A table is given showing the possible types of square lattice designs within a useful range of numbers of varieties and replicates.

*BREEDING 575

790. BELL, G. D. H. 575:633(42)
Crops and plant breeding.
J.R. Agric. Soc. 1944 : 105 : 1-12.

This article discusses various problems of crop production with reference to recent breeding work. Among the problems considered are varietal susceptibility to manganese deficiency in cereals, the appropriate use of strains in seeds mixtures, and the breeding of virus resistant varieties of potatoes.

Pioneer, the new variety of barley marketed in 1943, is described. It is a hybrid between the spring variety Spratt-Archer and the winter-hardy continental variety Tschermak's Two Row Winter, and shows a considerable degree of winter-hardiness.

791. 575:633(66.9)
Annual Report on the Agricultural Department of Nigeria for the year 1943 (1944) : S.P. No. 12 : Pp. 34.

Cotton

The most promising strain so far produced is 26 C, a derivative of D 5. Its yield of lint per acre in 1943 was double that of the standard adopted by the British Cotton Growing Association.

Cassava

A large number of varieties are under observation. A successful method of grafting is reported.

Coffee

Scions from Arabica coffee have been budded on to Liberia x Robusta stocks, with the object of discovering whether Arabica coffee on stronger stocks can thrive at the low altitude.

Cacao

Results from the trials of the Nigerian cacao selections again indicate that size of bean is an inherited character. Work on vegetative propagation was continued.

Ground nuts

Selections from the local variety Zaria Upright and K 38 (Ceylon) are being maintained.

792. 575:633(67.8)
Improvement of native food crops. A précis of the more important work done in East Africa during 1943.
Rep. E. Afr. Agric. Res. Inst., Tanganyika Territory 1944 : No. DF/5/2 : Pp. 11.

Sorghum

A collection of local and imported varieties was maintained in Nyasaland and the following were chosen as being most suitable for further selection: Kaswabanda, Dembera, Ngonkho, Nunkho, Nchiranyumbu and Nthengalamanja.

* General studies, see also individual crops.

Rice

Selections have been made in Kenya for early maturity. Promising selections have been obtained in the Lake Province of Tanganyika.

Potato

Crosses were made in Kenya between varieties of *S. andigenum* and various domestic potatoes.

Cassava

Interspecific hybridization and back-crossing in Amani have produced a number of forms showing apparently high resistance to virus disease but relatively few with desirable economic qualities. Selection in Nyasaland for mosaic resistance was continued. Promising virus resistant selections have been obtained in Zanzibar.

*GENETICS 575.1

793. MANTON, I. 575.17:576.312.32
Comments on chromosome structure.
 Nature, Lond. 1945 : 155 : 470-72, 510.

In this paper, the writer examines the implications of Schroedinger's suggestions as to the nature of the gene, in the light of recent cytological research on chromosome structure.

ORIGIN OF SPECIES 576.1

794. STEBBINS, G. L. (jun.) 576.12
Role of isolation in the differentiation of plant species.
 Nature, Lond. 1945 : 155 : 150-51.

The following five points are developed in order to elucidate the importance of isolation in specific differentiation. (1) Geographical isolation alone may not result in divergent evolution; (2) morphological differentiation may be unaccompanied by intersterility; (3) genetical isolating systems are developed gradually rather than *per saltem*; (4) naturally occurring genetical isolating mechanisms tend to be determined polymerically; and (5) the degree of intersterility between species may be uncorrelated with morphological differentiation. On the basis of these assumptions, it is suggested that evolution only proceeds when there is a positive inter-reaction between mutation, natural selection and the random fixation of genes in small populations.

*CYTOLOGY 576.3

795. CATCHESIDE, D. G. 576.312.34:537.5:539.185.9
Effects of ionizing radiations on chromosomes.
 Biol. Rev. 1945 : 20 : 14-28.

This paper describes the structural changes produced in chromosomes by irradiation with X-rays, protons, neutrons, and the α , β and γ -rays of radio-active substances, with reference to recent researches dealing mainly with *Tradescantia*.

796. MATHER, K. 576.312.341:575.1
The genetical activity of heterochromatin.
 Proc. Roy. Soc. 1945 : 132 : Ser. B : 308-32.

An investigation of the X and Y chromosomes in *Drosophila melanogaster* indicates that the heterochromatin in the chromosomes of the normal complement resembles the heterochromatin of supernumerary chromosomes in carrying polygenes.

797. NOUJDIN, N. J. 576.312.341:575.123
 575.312.332:575.123
Role of structural homo- and heterozygosity in mosaic formation.
 Nature, Lond. 1945 : 155 : p. 514.

The author discusses the significance of mosaicism in *Drosophila* in relation to the activity of heterochromatin; paternal and maternal effects of heterochromatin on mosaic formation are noted. The results of the discussion are used to outline a new concept of heterozygosis.

* General studies, see also individual crops.

798. DARLINGTON, C. D. and
LA COUR, L. F. 576.356:581.192:537.531
Chromosome breakage and the nucleic acid cycle.
J. Genet. 1945 : 46 : 180-267.

A comprehensive account is given of the problem of the relationship between X-irradiation, temperature, the nucleic acid cycle and nuclear division. The authors' own experiments have been made with *Trillium*, *Tradescantia*, *Allium* and *Vicia*, and have, in combination with the findings of other workers, led to the following conclusions:—

Low temperature reduces the content of thymo-nucleic acid in the nucleus while X-irradiation causes an increase. The constitution of nucleic acid is, however, affected by X-irradiation, and the resultant nucleic acid derivatives may cause chromosome stickiness, ineffective spiralization, failure of chromatid fission, and excessive crossing-over. Chromosome breakability is at a minimum when nucleic acid is not firmly attached, i.e. at prophase, and is at a maximum in resting stage nuclei. Rejoinability is conversely affected, being favoured by the attachment of nucleic acid to the chromosomes. The action of temperature on nuclear division is believed to be principally indirect, and brought about by its effects on nucleic acid metabolism.

There are two appendices, one by K. Mather on the calculation of sister-reunion frequency, and a second on the nuclear behaviour of pollen nuclei.

*INSECTICIDES 632.951.1

799. BALL, R. S. 632.951.1:581.165:581.143.7(67.62)
Pyrethrum cultivation in Kenya.

Tea Quart. 1944 : 17 : 28-36; also Nyasaland Agric. Quart. J. 1944 : 4 : 7-18.

This article includes a brief description of selection of root divisions in pyrethrum, and the method of propagation by seedlings.

ECONOMIC PLANTS 633

800. COOPER, W. C. and
STOUTEMYER, V. T. 633:577.17:581.165(72.98)
Suggestions for the use of growth substances in the vegetative propagation of tropical plants.
Trop. Agriculture, Trin. 1945 : 22 : 21-31.

The use of growth substances in the vegetative propagation of tropical plants is discussed, with reference to the concentration requirements of various species, the effectiveness of different growth substances, methods of applying the growth substance, supplementary treatments, the type and condition of the wood, environmental conditions during rooting, and other factors. A comprehensive list is given of papers dealing with the subject.

801. DILLON WESTON, W. A. R. and
SMITH, K. M. 633-2-1.521.6(42)
Crop diseases and their control.
J.R. Agric. Soc. 1944 : 105 : 125-32.

This article describes the chief diseases of crop plants, with references to varietal resistance.

802. HANSFORD, C. G. 633-2-1.521.6:575(67.61)
Uganda plant diseases.
E. Afr. Agric. J. 1945 : 10 : 147-51.

This article describes the diseases attacking crops in Uganda, and refers to the susceptibilities of varieties.

CEREALS 633.1

803. HARRINGTON, J. B. 633.1(71)
633.52(71)
Cereal variety zone co-ordination in the Prairie Provinces.
Sci. Agric. 1945 : 25 : 279-84.

For a number of years the Cereal Variety Zone Co-ordination Committee of the Western Canadian Society of Agronomy has functioned with the object of effectively co-ordinating the recommendations of varieties by the cerealists of the three Prairie Provinces. A discussion is given of the basic factors determining the recommendation of a variety and the relations between the

* General studies, see also individual crops.

variety zones and various soil zones. The recommended varieties of wheat, barley, oats and flax are briefly described with reference to these considerations.

804. 633.1(94.4)

Varieties of wheat, oats and barley recommended for 1945 sowing.

Agric. Gaz. N.S.W. 1945 : 56 : 3-7.

Descriptive notes are given of the recommended varieties.

805. THOMAS, I.,
MILLINGTON, A. J. and
CARISS, H. G.

633.1:575(94.1)

The utilisation of cereals in Western Australia.

J. Agric. W. Aust. 1944 : 21 : 206-26.

The development of the use of wheat, barley and oats in Western Australia is described in detail. Descriptions are given of the recommended varieties.

WHEAT 633.11

806. SANSOM, T. K. 633.11:575(68.9)

Wheat. Varieties tested at the Plant Breeding Station, Salisbury, and available for distribution.

Rhod. Agric. J. 1945 : 42 : 19-20.

Descriptions are given of the following wheat varieties: Reward, B 21-22.S.1., Jubilee, Kruger (bearded), Pioneer, B. 256.b.1.A.64 (L), Sabanero, Granadero Klein, Punjab 8A, 122.D.1.t.l., Pusa 4 and Beltista.

807. ARMSTRONG, J. M. 633.11:575.127.5:633.289:575.129(71)

Investigations in *Triticum-Agropyron* hybridization.

Emp. J. Exp. Agric. 1945 : 13 : 41-53.

This paper outlines the 9 years' progress in the intergeneric hybridization of many species of wheat and the two species *Agropyron elongatum* and *A. glaucum*, made with the object of obtaining large seeded, drought-resistant forage grasses for use in Western Canada. The work has included line breeding, back-crossing and the production of allopolyploids.

The degree of compatibility of various crossing combinations may be judged on the basis of crossability, plumpness of the crossed seed, germinability of the seed and fertility of the F_1 hybrid. The tetraploid wheats cross more readily than the hexaploid wheats, and the crosses with *A. glaucum* were more successful than the crosses with *A. elongatum*. Plumper seed resulted from the cross tetraploid wheat x *A. glaucum* than from the tetraploid wheat x *A. elongatum* cross. In the hexaploid wheat, the plumper seed came from crosses with *A. elongatum*. A significant correlation was found between plumpness of seed and germinability. The combination of hexaploid wheat x *A. elongatum*, which gave the lowest crossing success, provided the most fertile hybrids. The difference in crossability evidently has a physiological basis, the varying fertility in the F_1 plants clearly having a cytological explanation.

The F_1 *A. elongatum* hybrids showed a low degree of fertility, but the *A. glaucum* hybrids were completely sterile. The F_1 hybrids were generally intermediate between the parents in morphological characters with somewhat more resemblance to *Agropyron* than to wheat, and their hybrid vigour was strongly marked. Four generations of line-breeding have resulted in the gradual increase of fertility, seed weight and percentage of perennial plants, and in the agronomic characters constituting good forage value.

The *A. glaucum* hybrids were back-crossed with the wheat parents, in view of their sterility, due to failure of the anthers to dehisce, in an attempt to establish fertile lines. Back-crosses were also made with some of the *A. elongatum* hybrids in order to improve seed size and threshability. Back-crossing is the most promising method of improving the grain quality of the hybrids. The winter survival of many of the G_4 and G_5 lines is fully equal to that of the selfed lines and they are true breeding for the perennial habit.

The most striking recent advance has been the production of amphidiploids in the wheat x *A. glaucum* hybrids by the use of colchicine. Crosses with tetraploid species, *T. dicoccum*, *T. durum* and *T. turgidum*, have yielded the most amphidiploids. Since all the amphidiploids have the common parent *A. glaucum*, the differences that exist between the straws are largely due to

the morphological differences in the various wheat parents. The winter survival and seed-size range are, however, similar, and the creeping stolon habit of *A. glaucum* is largely retained. In the production of the polyploids two important points emerge. Doubling of the chromosome number does not appear to be effective with plants which are already of a highly polyploid nature. The chromosome number of an amphidiploid such as *T. dicoccum* x *A. glaucum* is not fixed at $2n = 70$; instead there is at least 50% of the F_2 plants with aneuploid numbers slightly less than 70; a study of F_3 progenies showed that this condition tends to adjust itself since the aneuploid types were associated with greater sterility. It is therefore suggested that in many naturally occurring allopolyploids there may have been a transitional period of several generations before the chromosome number of the new species was stabilized.

808. GREER, E. N. and HUTCHINSON, J. B. 633.11:581.142(42)
Dormancy in British-grown wheat.
 Nature, Lond. 1945 : 155 : 381-82.

This article includes a report on varietal differences shown by British wheats in respect of resistance to sprouting.

809. PETERSON, R. F. and MEREDITH, W. O. S. 633.11-2-1.521.6:581.6(71)
Agronomic and quality characteristics of Carleton durum wheat grown in the durum wheat area of Western Canada.
 Sci. Agric. 1944 : 25 : 107-13.

Field tests of the new variety Carleton, and the standard variety Mindum, have been carried out. Carleton has been obtained from the cross Vernal Emmer x Mindum back-crossed to Mindum twice. Carleton gave higher average yields in 9 tests, Mindum in 7, but only in one case was the difference statistically significant, Mindum having the higher yield. Carleton was distinctly superior to Mindum in straw strength and resistant to stem rust, but was somewhat more susceptible to kernel smudge. The macaroni-making quality of Carleton appeared to be equal if not slightly superior to that of Mindum. It seems probable that Carleton will be a useful variety in some parts of the durum wheat area, particularly in Manitoba where stem rust and lodging are usually more severe than in Saskatchewan.

810. WATSON, I. A. and WATERHOUSE, W. L. 633.11-2.452:576.16:631.521.6:575.11
A third factor for resistance to *Puccinia graminis* *Tritici*.
 Nature, Lond. 1945 : 155 : p. 205.

Three factors determining resistance to *P. g. Tritici* have now been differentiated. The first factor, found in Kenya 743 and its derivative Eureka, determines susceptibility to a new rust race that has recently appeared in Australia; the second factor, found in Kenya 744 determines resistance to this race; and the third factor, found in Kenya 745 and the wheat varieties deriving their resistance from *Triticum durum*, determines resistance similarly.

811. CRAIGIE, J. H. 633.11-2.452-1.521.6:631.557(71)
Increase in production and value of the wheat crop in Manitoba and eastern Saskatchewan as a result of the introduction of rust resistant wheat varieties.
 Sci. Agric. 1944 : 25 : 51-64.

The increase in wheat production and increase in income which have resulted from the development of rust resistant varieties since 1938-39 are discussed, together with other advantages such as the less severe infection in the barley crop. The growing of rust resistant varieties has increased the total average annual production by 41,339,000 bushels.

OATS 633.13

812. JONES, E. T. 633.13:575(42.9)
 633.11:575(42.9)
Aberystwyth-bred varieties of oats and pure line selections of Hen Gymro wheat.
 Leaflet. Ser. Welsh Pl. Breed. Sta. 1945 : No. 5 : Pp. 10.

The varieties of oats described in this leaflet include the varieties of white winter oats, Aberystwyth S.81, S.147 and S.172, and the varieties for spring sowing, Aberystwyth S.84, S.175, S.220.

Ceirch-du-bach S.79, Ceirch Llywd Cwta S.171 and Ceirch Llwyd S.75. Recent crosses made between the varieties S.147 and S.172 and others of related type show distinct promise of further improvements in hardy varieties. S.220 is a new black-grained variety, derived from the cross Victory x Radnorshire Sprig, which will be available for marketing in spring 1945. It is a reliable cropper giving on soils of only moderate fertility high yields of good average quality and a good grain straw ratio, and is rather more resistant to lodging than the Radnorshire Sprig parent. The pure line selections of Hen Gymro wheat described are S.70 and S.72.

813. WELSH, J. N. 633.13-2-1.521.6:581.6(71)

History, description, distribution and performance of Ajax and Exeter oats.

Sci. Agric. 1944 : 25 : 96-106.

Ajax was obtained from a cross Victory x Hajira made in 1930. It is an early maturing variety, with good straw strength and medium sized white kernel, evidently fairly well adapted to conditions in Eastern and Western Canada. It is resistant to stem rust, moderately resistant to crown rust in the mature plant stage, with a fairly high degree of resistance to smut and halo-blight. Exeter was obtained from a cross Victory x Rusota, made in 1929. It is usually slightly shorter in the straw and earlier than Victory. In Eastern Canada it yielded well in the Maritime Provinces and Quebec. In Western Canada it is better suited to the central and northern regions. It is resistant to stem rust and considerably resistant to halo-blight, but is susceptible to other diseases.

RYE 633.14

814. THOMPSON, W. P. and
JOHNSTON, D.

633.14:575.127.2:633.16:581.162.5

The cause of incompatibility between barley and rye.

Canad. J. Res. 1945 : 23 : Sect. C : 1-15.

An investigation was made of the possible causes of the lack of production of viable seeds when barley is pollinated with rye. The varieties used were Regal barley and Prolific rye. The immediate cause of the failure was found to be the abnormal development of the hybrid endosperm, and particularly of the endosperm nuclei which from an early stage were observed to be much enlarged and invariably few in number. No cells were formed in the endosperm, which collapsed on the fifth or sixth day after fertilization and disintegrated. The hybrid embryo, however, remained normal and healthy in appearance long after the endosperm had become abnormal or had collapsed, although from the third day it grew more sturdily than the barley embryo. The behaviour of the antipodal cells of the embryo sac was not significantly different from normal.

Reciprocal cross pollinations were also carried out. No evidence of the development of either embryo or endosperm was found when barley was the male parent.

BARLEY 633.16

815. MEREDITH, W. O. S. and
SALLANS, H. R.

633.16:581.6(71)

Varietal differences in barleys and malts. XIV. Intervarietal relations between wort properties and barley and malt properties.

Canad. J. Res. 1945 : 23 : Sect. F : 132-42.

"Data representing 24 barley varieties grown at six experimental stations in Canada were used to examine intervarietal relations among wort properties (degree of attenuation, viscosity, initial turbidity, final turbidity, and stability) and a number of barley, malting, and malt properties.

"The wort properties show significant associations with malt extract, saccharifying activity (Lintner value), and wort nitrogen, and also with barley salt-soluble nitrogen, hours steep, and malting loss, but they are not significantly related to barley starch, extract, or Lintner value after activation with papain. Degree of attenuation and stability increase, while viscosity and turbidity decrease, with increases in malt extract, saccharifying activity, wort nitrogen, barley salt-soluble nitrogen, and malting loss. It is concluded that the wort qualities are dependent on the development of enzymes in the growing barley and hence they reflect the extent of malt modification.

"Only one of the correlation coefficients is of such magnitude that a single malt property can be

regarded as a measure of a wort property. This is the coefficient ($r = .842$) between wort nitrogen and wort viscosity. The other associations discussed, though significant, are loose, and it is concluded that wort properties cannot be adequately predicted from the commonly measured barley and malt properties.

"It is suggested that the results of quality tests on laboratory worts give information of value in assessing the quality of brewery worts". [Authors' summary].

816. ANDERSON, J. A. 633.16:581.6:575(71)
Canadian research on malting barley. Part II. The relations between certain barley and malt properties.
 Emp. J. Exp. Agric. 1945 : 13 : 1-10.

Studies have dealt mainly with varietal differences in malting quality. They were designed primarily to assist agronomists and plant breeders. The limitations of the malting test have been assessed by investigating (1) its precision, (2) the differential effect of malting methods on varieties and (3) the differential response of varieties to environment. O.A.C. 21 has been established as the standard variety because of its high content of extractable material and its superiority in enzymatic activity. The relations between various barley and malt properties have been examined. This study has resulted in the use of rapid prediction tests, based on barley analyses, for selecting the most promising lines. Direct assistance has been given to plant breeders by testing over 4,000 samples during the past 8 years.

817. 633.16.00.14:581.6(42)
Annual report of the Council of the Institute of Brewing for the year ended 31st December, 1944. Advisory Sub-Committee on barley.
 J. Inst. Brew. 1945 : 51 : 72-73.

A preliminary report is given of the three-year series of trials carried out by the National Institute of Agricultural Botany, Cambridge, with the two new promising barleys, Archer x Spratt and an early ripening selection of Spratt-Archer. No significant difference was obtained between the yields of Archer x Spratt and the control; the yield of the selection of Spratt-Archer was inferior to that of the control. In the malting tests Archer x Spratt was slightly superior and the early ripening selection definitely inferior to the control.

RICE 633.18

818. DASH, J. S. 633.18:575(88)
Report of the Department of Agriculture, British Guiana for the year 1943 (1944) : Pp. 12.

Replicated variety tests have revealed a number of rices likely to outyield D 110 by 5-13%. The seed of two of the new long-grained hybrids, which are stiff-strawed and good yielders, will be available for tests on a commercial scale in 1944.

LEGUMINOUS FORAGE PLANTS 633.3

819. CORKILL, L. 633.322:581.192:575.11
Cyanogenesis in white clover (*Trifolium repens* L.). V. The inheritance of cyanogenesis.
 N.Z. J. Sci. Technol. 1942 : 23 : 178B-193B.

The dominant gene *Li* controls the presence of the enzyme linamarase in white clover. The dominant gene *Ac* controls the presence of the glucoside lotaustralin. The genes *Li* and *Ac* segregate independently. Cyanogenetic plants contain both *Li* and *Ac*, while non-cyanogenetic plants may contain either one or neither of the genes. The differences in the quantity of glucoside in white clover are probably due to the effect of modifying genes.

820. HILLS, K. L. 633.326:581.143.26
Dormancy and hardseededness in *T. subterraneum*. 2. The progress of after-harvest ripening.
 J. Coun. Sci. Industr. Res. Aust. 1944 : 17 : 186-90.

A determination was made of the length of the post-harvest ripening period with seed of nine different varieties of subterranean clover showing varying degrees of dormancy.

821. HILLS, K. L. 633.326:581.143.26:581.036
Dormancy and hardseededness in *T. subterraneum*. 3. The effect upon dormancy of germination at three different constant temperatures.

J. Counc. Sci. Industr. Res. Aust. 1944 : 17 : 191-96.

Experiments were carried out to determine the behaviour of the mature seed of a number of varieties of subterranean clover, and of seed showing various degrees of delayed germination, when germinated at the constant temperatures 10° C., 20° C. and 30° C.

822. HILLS, K. L. 633.326:581.143.26:581.48(94)
Dormancy and hardseededness in *T. subterraneum*. 4. Variation between varieties.

J. Coun. Sci. Industr. Res. Aust. 1944 : 17 : 242-50.

The percentage of hard seed and the degree of delayed germination were studied in a number of varieties of subterranean clover. The varieties differed in their tendency to produce dormant seed, but it was concluded from the data that either hardseededness is not a varietal character, or varietal differences are of a low order and usually masked by the effect of environmental conditions.

ROOTS AND TUBERS 633.4

823. **New potatoes raised in Northern Ireland.** 633.491:575(41.6)
 Gdnrs' Chron. 1945 : 117 : p. 14.

This article describes recent varieties bred in Northern Ireland. These include the Ulster series and Stormont Down and Stormont Star. Mention is made of the promising new seedlings Nos. 832 and 848.

824. CARSON, G. P. and 633.491:575.11.061.6
 HOWARD, H. W. 633.491-2.8-1.521.6
Note on the inheritance of the King Edward type of colour in potatoes.
 J. Genet. 1945 : 46 : 358-60.

The variety King Edward is simplex for the gene *K*, determining pink periderm coloration, and multiplex for gene *R*, which induces pink cortical pigmentation. A converse arrangement obtains for the variety Flourball.

None of the seedlings obtained by pollinating King Edward contained paracrinkle virus.

825. HAWKES, J. G. 633.491:576.16
The story of the potato.
 Discovery 1945 : 38-46.

A popular account is given of the origin and introduction of the potato into cultivation and of the species existing at the present time. The author concludes that the domestic potato arose from *Solanum andigenum* introduced into Europe between 1570 and 1590, two separate introductions having been made.

826. LAMPITT, L. H.,
 BAKER, L. C. and
 PARKINSON, T. L. 633.491:577.16(41)
Vitamin-C content of potatoes. II. The effect of variety, soil, and storage.

J. Soc. Chem. Ind., Lond. 1945 : 64 : 22-26.

The samples were taken from four widely scattered areas in England and Scotland. Results obtained from freshly harvested and stored potatoes showed a steady decline in average concentration of vitamin C. The figure fell from about 0.30 mg. per grm. at the end of August to 0.08 mg. per grm. in January, and then remained at this level until July. The only significant varietal difference was found during the period of decline from August to December, the results for King Edward VII potatoes being consistently higher than those for other varieties.

827. THOMAS, P. T. 633.491:581.14:576.356.2
'Bolters' in potatoes.

Nature, Lond. 1945 : 155 : p. 242.

The "bolter" forms of the varieties Gladstone, Doon Star and Majestic are characterized by the presence of a small additional chromosome fragment.

828. BALD, J. G. 633.491:581.143(94)
Transmission of potato virus diseases. 4. Ground work studies on the growth of normal potato foliage.
 J. Coun. Sci. Industr. Res. Aust. 1944 : 17 : 94-111.

Various growth data were obtained by periodical measurements of the leaf area in different varieties and strains during the earlier stages of development.

829. HAWKES, J. G. 633.491-1.524:575(8)
The indigenous American potatoes and their value in plant-breeding. Part I. Resistance to disease. Part II. Physiological properties, chemical composition, and breeding capabilities.
 Emp. J. Exp. Agric. 1945 : 13 : 11-40.

The various uses to which the indigenous American potatoes have been put are described, and the lines of research which might prove valuable in the future outlined. Probably the most useful wild species are to be found in the series *Acaulia*, *Demissa* and *Longipedicellata*. *S. demissum*, in particular, has proved to be of all-round value, both because of its resistance to blight, Colorado beetle, and frost, and also because of its fertility when selfed and crossed with the tetraploid *S. andigenum* and *S. tuberosum*. The high proportion of wild-type undesirable characters, however, necessitates a very large number of hybrid generations, either by selfing or back-crossing with a variety of *S. tuberosum* or *S. andigenum*, before economically useful varieties are obtained.

S. andigenum, the most promising cultivated species, possesses high vigour, yield, protein, vitamin C and starch content, together with a greater range of flavour and cooking qualities than the ordinary European domestic potato. In contrast to the European potato, it is also highly fertile. There is no doubt that it could be used advantageously in most breeding programmes in addition to the wild species. Possibly in some parts of the Empire *S. andigenum* might even supplant *S. tuberosum* in contributing factors for yield and tuber quality.

The author suggests that the building up of certain hybrid stocks would be of great advantage to the breeder, using as a basis some of the most economically important wild and native cultivated species and incorporating all the necessary qualities of disease resistance with moderate yield and high fertility. Much time would thus be saved. In problems that have hardly been touched, such as eelworm immunity in Great Britain, the need for a thorough survey of the indigenous American potatoes is emphasized.

The systematic classification and geographical distribution of the native American potatoes is also discussed, with special reference to the work of the Empire Potato Collection of the Imperial Agricultural Bureaux at Cambridge, and the fertility of the various species and the results that have been obtained in interspecific crosses are briefly described.

830. BALD, J. G. 633.491-2.8-1.557(94)
Development of differences in yield between FX and virus X-infected Up-to-Date potatoes.
 J. Coun. Sci. Industr. Res. Aust. 1944 : 17 : 263-73.

At first harvest no difference in total yield was observed that could be attributed to the presence or absence of virus. At final harvest the virus free Up-to-Date yielded significantly higher than the infected Up-to-Date. It was concluded that differences in yield only begin to appear when the plants draw on the reserves of stored protein in the leaves for the further growth of the tubers.

FIBRES 633.5

831. WELLS, W. G. 633.51:575(94.3)
A review of the 1943-44 cotton growing season.
 Qd Agric. J. 1944 : 59 : 264-67.

Some of the advanced strains of Triumph are superior to the parent stock in fibre quality and size of boll, and are not inferior in earliness of fruiting or yielding capacity. The most advanced strain of Lone Star produces more uniform fibre, and has a slightly higher lint percentage than the commercial stock. Superior strains of Miller give greater uniformity of fibre and higher lint percentages. Promising new selections have been obtained from the varieties New Mexico, Acala and Qualla. The work of developing jassid-resistant types by selection of superior jassid-resistant plants from commercial stocks of Miller or hybridization of jassid-resistant varieties with

otherwise superior Miller strains has produced promising results. Tests of the Miller selection, III-26-0, have again indicated the high degree of jassid resistance.

832. LEWIS, D. 633.51:575:578.08
The science of plant breeding.
 Nature, Lond. 1945 : 155 : 355-56.

An account is given of Harland's work in improving the Peruvian cotton variety Tangüis (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 661). Special emphasis is laid on the fact that pure line breeding was abandoned in favour of mixed strain selection, the final product combining a genetical diversity with superior quality.

833. GOVANDE, G. K. 633.51:575.116.1(54.7)
Linkage relations of the li_d gene for lintlessness in Asiatic cottons.
 Curr. Sci. 1944 : 13 : 321-22.

In a further study of the gene li_d , the Baroda lintless mutant was crossed with the white pollen mutant Cocanada 45, the Burma laciniated A8, and a new multiple recessive which was isolated from a cross of N6 multiple recessive with Cocanada 45. Results show that the li_d gene for lintlessness in the Baroda lintless mutant is linked with the leaf-shape locus with a cross-over value of $17.05\% \pm 1.72$, and with the lint colour locus with a cross-over value of $20.46\% \pm 1.97$. The leaf-shape gene is linked with the lint colour gene with a cross-over value of $26.93\% \pm 2.28$, a value which confirms the linkage reported by Hutchinson (*Plant Breeding Abstracts*, Vol. IV, Abst. 861) with a cross-over value of approximately 30%.

834. STEPHENS, S. G. 633.51:581.04:576.356.5:575.127.2:582
Colchicine-produced polyploids in *Gossypium*. II. Old World triploid hybrids.
 J. Genet. 1945 : 46 : 303-12.

Tetraploid plants of *G. arboreum* obtained by the colchicine technique have been crossed with other Old World species, and a cytological study has been made of the meiotic processes of the resultant triploid hybrids. In general, crosses either within the Old World or the American group may be considered as potentially compatible, cases of sterility appearing to be caused principally by mechanical obstructions. Crosses between Old World and American species are easily effected but the zygotes usually fail to develop. The triploid hybrids studied formed a quantitative series ranging from autotriploidy to allotriploidy, suggesting that speciation within the genus has been a gradual process.

G. Stocksii, on cytological evidence, does not appear to be closely related to the other Old World species, although data drawn from comparative morphology, geographical distribution and compatibility relationships appear to suggest the opposite. *G. anomalum* is in several respects intermediate between the Old World and American groups.

835. STEPHENS, S. G. 633.51:581.45:575.113.3
A genetic survey of leaf shape in New World cottons—a problem in critical identification of alleles.
 J. Genet. 1945 : 46 : 313-30.

A single multiple allelomorphous series, comprising a minimum of four members L^+ , L^0 , L^B and l , determine the leaf shape of New World cottons. A critical determination of particular alleles is sometimes difficult to effect, and a consideration is given of this problem, including the comparative examination of developmental tracks. The interspecific distribution of the genes cited is described, and the evolutionary significance of the various findings is elucidated.

836. STEPHENS, S. G. 633.51:581.45:575.113.5
The modifier concept. A developmental analysis of leaf-shape 'modification' in the New World cottons.
 J. Genet. 1945 : 46 : 331-44.

An analysis has been made of the developmental tracks of the leaves of New World cottons in order to elucidate the relationship between the main genes determining leaf shape (the L series) and the modifying factors. It was found that the genes determining flowering habit were a major source of modification in leaf-shape expression, which fact indicates that modifiers may exert a very considerable individual effect and may moreover be subject to natural selection. The distinction between main genes (oligogenes) and modifiers (polygenes) may be merely a matter of degree.

837. STEPHENS, S. G. 633.51:581.45:581.14:575.11
Canalization of gene action in the *Gossypium* leaf-shape system and its bearing on certain evolutionary mechanisms.
 J. Genet. 1945 : 46 : 345-57.

The expression of leaf-shape in *Gossypium* appears to be determined by a system of five alternative developmental tracks, the courses of which are little affected by the environment or by modifying genes. The "rate" of development may, however, be either retarded or accelerated, thereby allowing considerable scope for phenotypic differentiation.

Such a system of "canalized" development is of considerable theoretical interest from the point of view of evolutionary theory. It is considered in relation to the expression of dominance and to the occurrence of non-adaptive trends.

838. ADMAD, N. and GULATI, A. N. 633.51:581.6(54.7)
The effect of storage under certain specified conditions on the quality of Indian cottons.

Technol. Bull. Indian Cott. Cttee 1942 : No. 31 : Pp. 21.

This paper describes the effect of storage on certain properties of Indian cottons. The conditions of storage were (1) Bombay weather, (2) controlled humidities at room temperature and at constant temperature, and (3) controlled humidity combined with watering of the cotton. The characters studied were fibre strength, incidence of infection and shade of cotton. Tests were also made on fibre length, fibre weight per inch and spinning quality.

SUGAR PLANTS 633.6

839. What the scientists are doing. The 1944 batch of Co. canes. 633.61:575.42(54.8)
 Indian Fmg 1944 : 5 : p. 420.

The selections released in 1944 from the Coimbatore station are described. A few of these canes are rich in sucrose and fairly early in maturity. The eleven selections also include "general purpose" canes of the thickish and thin medium types.

840. WIEHE, P. O. 633.61-2.483-1.521.6(69.82)
Red rot and M 134/32.
 Rev. Agric. Maurice 1944 : 23 : 242-43.

The sugar cane variety M 134/32, although more resistant to red rot than many varieties, has been seriously attacked during 1944. It is recommended that this variety be not used as a "grande saison" cane.

STIMULANTS 633.7

841. Annual report of the Department of Agriculture, Colony of Mauritius, 1943. 633.71:575(69.82)
 Port Louis 1944 : Pp. 30.

The work of intervarietal crossing in tobacco was continued. In a group of seven crosses between Amarello and other varieties, in each case the Amarello characteristics were dominant and hybrid vigour was marked. Crosses were carried out between plants raised from colchicine treated seed of the varieties Bonanza and Amarello.

842. BOND, J. 633.72:581.165.72:581.143.7(54.8)
Seedlings and cuttings.
 Tea Quart. 1944 : 17 : 20-21.

The theoretical aspects of vegetative propagation of tea as compared with propagation from seed are briefly discussed.

843. MYER, S. 633.79:581.6
New varieties of hops.
 Brew. Tr. Rev. 1945 : 59 : 57-58.

It is suggested that none of the new hop varieties recently developed can be regarded as completely satisfactory substitutes for the old. The qualities desired in a good hop are briefly discussed.

and it is pointed out that wide variations in flavour appear to characterize the recent introductions in contrast to the more fixed qualities of the older varieties.

844. 633.79-2.484-1.521.6(42)
633.79-2.8-1.521.6(42)

Annual report of the Council of the Institute of Brewing for the year ended 31st December, 1944. Advisory Sub-Committee on hops.

J. Inst. Brew. 1945 : 51 : 74-77.

In a test of forty varieties developed at Wye, the variety Oj 47 showed marked resistance to *Verticillium* wilt. Among previously selected varieties, OB 53 and AEE 55 are the most resistant, but both are somewhat low croppers. The good cropping hop OR 55 is slightly less resistant. The study of virus diseases has been continued at Long Ashton and East Malling. At East Malling seedlings from Wye are being tested for susceptibility to nettlehead, and male plants susceptible to mosaic are being selected for planting in gardens of Goldings. The new varieties V 32, OJ 47, 401, OH 77, and seven selections of Goldings have been selected for brewing trials in 1945.

CONDIMENTS 633.84

845. MOLEGODE, W. 633.841(54.8)
The arecanut in Ceylon:
Trop. Agriculturist 1944 : 100 : 102-05.

This article describes the cultivation and uses of areca nut or the betel nut in Ceylon. Notes are given of the three varieties Sinhalapuwak, Ratapuwak and Hambanpuwak.

OIL PLANTS 633.85

846. GARNETT, C. B. 633.854.56:575(68.9)
Report of the Department of Agriculture, Nyasaland Protectorate, for the year 1943 : Pp. 15.

Promising mother trees of *Alcurites montana* are being propagated as buddings on seedling rootstocks. Final selection of the resulting clones will be based on the performance of the buddings rather than on the yields of the mother trees. Observations on flowering and pollination in budded plantations have been continued. The provision of a small proportion of early flowering male trees appears to be desirable, even in a plantation of mixed clones. A considerable number of seedlings have been obtained by crossing. Experiments are also in progress with material derived from open-pollinated seed of selected trees and from clonal seed of isolated buddings.

FRUITS 634

847. THOMAS, L. A. 634.11:581.43(94)
Stock and scion investigations. III. The root-systems of some own-rooted apple trees.
J. Coun. Sci. Industr. Res. Aust. 1944 : 17 : 167-78.

A study has been made of the root systems of 39 varieties of two and three year-old own-rooted apple trees, produced by layering. Wide differences were found in the lateral spread of the roots, their penetration in depth, in the number of main roots formed, the size of the trees produced and the ratio by weight of shoot growth to root growth.

848. WALLACE, T.,
SWARBRICK, T. and
OGILVIE, L. 634.11-2.8:581.143.32(42)
Some new troubles in apples with special reference to the variety Lord Lambourne.
Grower, Lond. 1944 : 22 : 12-13; also Fruit Grower 1944 : 98 : p. 427.

Four distinct abnormal conditions have been recognized in the new variety, Lord Lambourne, to which the following terms have been applied: (1) rubbery wood, (2) chat fruits, (3) apple mosaic, and (4) flat limb. The abnormalities are widely distributed, and although distinct do not necessarily occur singly; the proportions in which they occur vary considerably. The abnormalities have many of the characters of virus diseases. Further work will be necessary, however, to establish that all abnormalities are true virus diseases.

849. CRANE, M. B. 634.11-2.8:581.165.71(42)
The mystery of Lord Lambourne.

Grower, Lond. 1944 : 22 : No. 53 : 10-11, 12.

The "rubbery growth" and "chat" fruit abnormalities of the apple variety Lord Lambourne appear to be of the nature of viruses and to have originated in grafting.

850. SIMMONDS, A. 634.11:9(42)
The origin of apple "Bramley's Seedling".

J.R. Hort. Soc. 1945 : 70 : 99-103.

The history of Bramley's Seedling is discussed.

851. DAJI, J. A. 634.441:581.165.71(54.7)
What's doing in All-India—Bombay.
 Indian Fmg 1944 : 5 : 324-25.

This article describes a new method of bud-grafting mango, developed at the Ganeshkhind Fruit Experimental Station, Kirkee. It is believed that the method can be applied with equal success in other parts of India for budding mango and other evergreen fruit trees such as chiku (*Achras Sapota*).

852. GRUBB, N. H. and
 HARRIS, R. V. 634.711:581.165:632-1.521.6(42)
The planting and maintenance of raspberry cane nurseries.
 Gdnrs' Chron. 1945 : 117 : 27, 33-34.

Methods of planting raspberries for propagation purposes are discussed in relation to varietal susceptibility or resistance to disease.

853. DODDS, K. S. 634.771:581.162.5
Genetical and cytological studies of *Musa*. VI. The development of female cells of certain edible diploids.
 J. Genet. 1945 : 46 : 161-79.

An investigation has been made into the causes of female sterility exhibited by various diploid banana clones. Multiple archesporia, structural hybridity and failure of embryo-sacs to receive a pollen tube may contribute to female sterility but are not prime factors. Successful meioses and subsequent fertilizations may occur but the zygotes so formed fail to develop. It is suggested that these failures may be brought about by disturbances in the timing relations of post-fertilization development and may be correlated with the incidence of parthenocarpy.

FORESTRY 634.9

854. POMERLEAU, R. 634.972.2-2.4-1.521.6:575.42
Les maladies de l'érable à sucre et leur prévention. (The diseases of the sugar maple and their prevention).
 Forêt Québécoise 1945 : 9 : 311-48.

This account of the diseases of the sugar maple includes a reference to methods of control including the selection of resistant trees.

855. DOYLE, J. 634.975:582:001.4
Naming of the redwoods.
 Nature, Lond. 1945 : 155 : 254-57.

The differences between the two species formerly included in the genus *Sequoia* are analysed, and it is concluded that they are insufficient to justify a generic separation. Both on palaeontological and morphological grounds, it is believed that the differences between the two species are of lesser magnitude than those at present existing between the species of many other coniferous genera.

VEGETABLES 635

856. 635.13-2.8-1.521.6(94.4)
A new disease of carrots.
 Agric. Gaz. N.S.W. 1944 : 55 : 493-94.

A survey has been made upon the occurrence of a virus disease believed to be carried by the common carrot aphid, *Cavariella aegopodii*. Most of the popular varieties appear to be susceptible. One variety, however, Osborne Park, has shown a high degree of tolerance.

857. BROWN, F. C. 635.64:575(42.21)

Dwarf and bush tomatoes.

J.R. Hort. Soc. 1945 : 70 : 81-83.

Several varieties of dwarf and bush tomatoes were grown at Wisley in 1944, and compared with well-known varieties. Crop weights and plant characters are given.

858. RICHE, F. J. H. LE 635.64:577.16(68)

Ascorbic acid content of tomato varieties.

Fmg S. Afr. 1945 : 20 : 105-10.

The ascorbic acid content, soluble solids and total acidity showed varietal differences. There appeared to be a positive correlation between the ascorbic acid content and total acidity. In canning, certain varieties retained more ascorbic acid than others. Total loss in canning was found to be 38%.

859. CRANE, M. B. 635.64-2.484-1.521.6:575.11

Inheritance of resistance to leaf-mould in tomatoes.

Gdnrs' Chron. 1945 : 117 : p. 123.

An investigation has been made at the John Innes Horticultural Institution on the inheritance of resistance to *Cladosporium fulvum*. In the resistant varieties Vetomold and Clark's "Leaf-mould Resister" resistance behaves as a dominant character but in Bewley's "Leaf-mould Resister" it is recessive. Results from the F_2 of the cross Bewley's L.M.R. x Vetomold depart rather widely from theoretical expectation suggesting that more than two factors may determine resistance in different varieties. The possibilities are briefly discussed of different strains of *Cladosporium* or different strains of varieties being involved.

860. GILES, W. F. 635.67:575(42)

Sweet or sugar corn.

J.R. Hort. Soc. 1945 : 70 : 54-56.

A description is given of sweet corn, with reference to the varieties suitable for cultivation in Great Britain.

861. DAWSON, C. D. R. 635.67:575.125(42)

Sweet corn in England.

J.R. Hort. Soc. 1945 : 70 : 111-19.

The production and uses of hybrid maize in America are described. The most promising result of the investigation begun at the John Innes Institution in 1935 with the object of obtaining varieties of sweet corn suitable for growing in England, is the new hybrid variety, Canada Cross, produced by the top-cross Canada Gold x inbred C 13. This new early hybrid has a significantly greater number of first grade ears than Canada Gold. The hybrid Sencross 39, produced by the top-cross of Early Yellow Sensation and Purdue 39, is a promising late variety.

Part II. Foreign

*STATISTICS 519

862. BANCROFT, T. A. 519.24
On biases in estimation due to the use of preliminary tests of significance.

Ann. Math. Statist. 1944 : 15 : 190-204.

In two stock problems of estimation, the estimate of one constant will depend upon an earlier decision regarding the significance of a second constant.

(i) In the analysis of variance where s_1^2 is an estimate of $n_o\sigma_1^2 + \sigma_o^2$, s_o^2 is an estimate of σ_o^2 , the estimate of $u_o\sigma_o^2$ will be different according as σ_1^2 is assumed significant or not. $E(u_o) = \sigma_o^2 + R$, where R is the bias which is expressed in terms of the incomplete beta function.

(ii) In fitting a line to a sample from a true regression $Y = \beta_1x_1 + \beta_2x_2$, we get a line $y = b_1x_1 + b_2x_2$, $E(b_1) = \beta_1 + R$, where R is the bias depending on the assumptions made concerning β_2 . It is shown that R is independent of β_1 .

Some tables are provided for the bias in the two general cases considered.

S. N. C.

863. DIXON, W. J. 519.24
Further contributions to the problem of serial correlation.

Ann. Math. Statist. 1944 : 15 : 119-44.

The main body of the paper is devoted to the finding of an approximate distribution of the likelihood ratio, for the testing of the hypothesis that certain sets of observations of the form x_α from a sample of n , taken in a definite order, are independent of certain other sets of the form $x_{\alpha+l}$ where l is an integer. Thus in the simplest case, we suppose that x_1, x_2, \dots, x_n are distributed jointly according to the law

$$\left(\frac{1}{\sqrt{2\pi}\sigma}\right)^n e^{-\frac{1}{2\sigma^2}\sum(x_\alpha - a - bx_{\alpha-l})^2} dx_1 dx_2 \dots dx_n, \text{ likelihood ratio being } \lambda_1 = (1 - \hat{b}^2)^{n/2}.$$

$$\text{If } a \text{ is zero, we have } \hat{b}_o = \frac{\sum x_\alpha x_{\alpha+l}}{\sum x_\alpha^2},$$

and the moment generating function of the joint distribution of

$$\begin{aligned} C_o &= \sum x_\alpha x_{\alpha+l}/\sigma^2 \\ V_o &= \sum x_\alpha^2/\sigma^2 \end{aligned}$$

is asymptotic to $\{\frac{1}{2}(A + \sqrt{A^2 - B^2})\}^{-\frac{n}{2}}$,

where

$$\begin{aligned} A &= 1 - 2t_2 \\ B &= -2t_1. \end{aligned}$$

If M_r is the r^{th} moment of the asymptotic distribution of \hat{b}_o , it is shown that

$$M_{2k-1} = 0$$

$$M_{2k} = \frac{1.3.5 \dots (2k-1)}{(n+2)(n+4) \dots (n+2k)}.$$

Further, if α is the *h.c.f.* of n and l , the moments given above are exact for $k < n/\alpha$. It follows that $\hat{b}_o = x$ is distributed to n/α moments with probable density function $= K_1 (1 - x^2)^{\frac{1}{2}(n-1)}$, and $\lambda_1^{2/n} = (1 - \hat{b}_o^2) = y$ is distributed to $n/2\alpha$ moments with *p.d.f.* $= K_2 (1 - y)^{-1} y^{\frac{1}{2}(n-1)}$. Similarly $\lambda_1^{2/n} = (1 - \hat{b}^2) = z$ is distributed to $n/2\alpha$ moments with *p.d.f.* $= K_3 (1 - z)^{-1} z^{\frac{1}{2}(n-1)}$. Tables are given for the 5% and the 1% tails of λ_1 , for sample sizes ranging from 5 to 75, when distribution (i) is assumed approximately normal, (ii) is assumed to be Pearson Type I (as above), and (iii) is exact as calculated by R. L. Anderson. These results are extended to hypotheses concerning the more general distribution

$$\left(\frac{1}{\sqrt{2\pi}\sigma}\right)^n e^{-\frac{1}{2\sigma^2}\sum_{\alpha=1}^n \{x_\alpha - a - \sum b_i x_\alpha - l_i\}^2} dx_1 \dots dx_n,$$

and they are applied to the derivation of the approximate distribution of the squares of successive differences for

$$\sigma\eta_1 = \frac{\delta_n^2}{\sum x_i^2} \frac{\sum (x_i - x_{i+1})^2}{\sum x_i^2} = 2(1 - \hat{b}_o).$$

S. N. C.

* General studies, see also individual crops.

864. PÄTAU, K. 519.24
 Eine neue χ^2 Tafel. (**A new χ^2 table**).
 Z. indukt. Abstamm. -u. VererbLehre 1942 : 80 : 558-64.

A short discussion on the calculation and applicability of the χ^2 statistic is presented, and a table is given of χ^2 values for 1-150 degrees of freedom, and for values of P between 10^{-10} and 0.999.

865. ROBBINS, H. 519.24
On distribution-free tolerance limits in random sampling.
 Ann. Math. Statist. 1944 : 15 : 214-16.

This research note gives an important theorem and converse on distribution free limits. Suppose X_1, X_2, \dots, X_n are independent variables, each with differentiable and continuous cumulative distribution function $\sigma(x) = P(X_i \leq x)$; $f(x_1 x_2 \dots x_n)$ is defined to be a distribution free upper tolerance limit (*d.f.u.t.l.*) if $Y = \sigma\{f(X_1 X_2 \dots X_n)\}$ has distribution independent of $\sigma(x)$.

The importance of $f(x_1 x_2 \dots x_n)$, if it exists, is that we are able to make the statement: "we shall be right a proportion $1 - \alpha$ of times in asserting that less than a proportion β of the original population had a value exceeding $f(X_1 X_2 \dots X_n)$ ", where $f(X_1 X_2 \dots X_n)$ depends only on the sample. It is shown that the necessary and sufficient condition for f to be a *d.f.u.t.l.* is

that $\bar{f}(x_1 x_2 \dots x_n) = \prod_{i=1}^n \{f(x_1 x_2 \dots x_n) - x_i\} \equiv 0$, and conversely that the only symmetrical *d.f.u.t.l.*'s are n in number, of which the r^{th} is that which takes the value of the r^{th} variable X_i , when the X 's are arranged in ascending order of magnitude.

$f(x_1 x_2 \dots x_n)$ is defined to be symmetric if its value is unchanged by any permutation of the x 's. S. N. C.

866. SCHEFFÉ, H. and 519.24
 TUKEY, J. W.
A formula for sample sizes for population tolerance limits.
 Ann. Math. Statist. 1944 : 15 : p. 217.

A paper is shortly to be published on the subject, but a result there included is given here for immediate use.

X_1, X_2, \dots, X_n is a random sample from a distribution $F(x)$. Z_1, Z_2, \dots, Z_n is the permutation of the above set in ascending magnitude. Take $Z_0 = -\infty, Z_{n+1} = \infty$. There will then exist an n such that "the probability is $1 - \alpha$ that the random interval $Z_k Z_{n-m+1}$ covers a proportion $\geq b$ of the population $F(x)$ ", where n is approximately $\frac{1}{4} \chi_{\alpha}^2 (1+b)(1-b) \div \frac{1}{2}(r-1)$; where χ_{α}^2 is the $100\alpha\%$ point on the χ^2 distribution with $2r$ degrees of freedom; $r = k + m$. For $\alpha = .1, .05, .005, b \geq .9$, the error in the approximation exaggerates n by an amount .001. S. N. C.

867. WALD, A. 519.24
On a statistical problem arising in the classification of an individual into one of two groups.
 Ann. Math. Statist. 1944 : 15 : 145-62.

The problem considered is as follows: π_1, π_2 are each p variate normal distributions with common co-variance matrix σ_{ij} ; π_1 has mean μ_i , and π_2 has mean ν_i ; given that $(x_{1\alpha}, x_{2\alpha}, \dots, x_{p\alpha}) \alpha = 1, 2, \dots, N$, is a random sample from π_1 , $(y_{1\alpha}, y_{2\alpha}, \dots, y_{p\alpha}) \alpha = 1, 2, \dots, N$, is a random sample from π_2 , (z_1, z_2, \dots, z_p) is from π_1 or π_2 (not both); what is the appropriate test? If H_1 is hypothesis that z_i is from π_1 , H_2 is hypothesis that z_i is from π_2 , $p_1(z_1, z_2, \dots, z_p)$ is joint *p.d.f.* of z_i on H_1 , $p_2(z_1, z_2, \dots, z_p)$ is joint *p.d.f.* of z_i on H_2 , the most powerful critical region is given by $p_2/p_1 \geq k$. Denote by σ^{ij} the (i, j) element of the inverse of the covariance matrix, then on substituting in the maximum likelihood estimates of σ, μ, ν , we get $U = \sum_{ij} s^{ij} z_i (y_i - \bar{x}_j) \geq d$.

For large N_1, N_2 , U is normally distributed.

If the relative importance of errors of the first and second kind can be represented by weights, we may find the approximate sample size. A complicated set of lemmas leads to the exact distribution of U . S. N. C.

868.

WOLFOWITZ, J.

519.24

Asymptotic distribution of runs up and down.

Ann. Math. Statist. 1944 : 15 : 163-72.

Suppose a_1, a_2, \dots, a_n are a set of values in random order; there are $n - 1$ algebraic differences; we are concerned here only with the signs of these differences. If there are p successive positive signs not bordered by positive signs, we call it a run up of length p ; similarly for runs down. Denote by r_p the number of runs (up or down) of length $= p$, and by r'_p the number of runs

(up or down) of length $\geq p$; let $y_p = \frac{r_p - E(r_p)}{\sqrt{n}}$, $y'_p = \frac{r'_p - E(r'_p)}{\sqrt{n}}$.

If l is any non-negative integer, the joint distribution of $y_1, y_2, \dots, y_l, y'_{l+1}$ approaches normality as $n \rightarrow \infty$. The proof depends on an unstated theorem of Liapounoff. The middle portion of the paper is concerned with an abstract extension of the above theorem; and then we get a useful

theorem for long sequences, namely, if $\frac{(p-1)!}{n} = \frac{1}{K}$, $\lim_{n \rightarrow \infty} P(r_p = j)$ is a Poisson distribution with parameter $m = 2K$. The method of proof is to verify that the moments of r_p equal the moments of the appropriate Poisson distribution. S. N. C.

869.

LI, J. C. R.

519.24:631.421

Design and statistical analysis of some confounded factorial experiments.

Res. Bull. Ia Agric. Exp. Sta. 1944 : No. 333 : 453-92.

This is a useful exposition of some new practical designs of factorial experiments. These designs help to fill up the previous gaps in the list of designs available, and are presented after a review of previous work on confounding in factorial experiments. The new types are summarized below:

| Factorial type | Plots per block | Minimum number of replications | Lowest order interaction confounded |
|----------------|-----------------|--------------------------------|-------------------------------------|
| 4 x 2 x 2 | 4 | 3 | First |
| | 8 | 3 | Second |
| 4 x 4 x 3 | 12 | 3 | First |
| 4 x 4 x 2 | 8 | 3 | First |
| | 16 | 1 | Second |
| 4 x 2 x 2 x 2 | 8 | 3 | Second |
| 5 x 2 x 2 | 10 | 5 | First |
| 3 x 3 x 2 x 2 | 12 | 2 | First |
| 4 x 3 x 3 | 12 | 2 | First |
| 3 x 3 x 3 x 2 | 18 | 2 | Second |
| 4 x 3 x 2 | 12 | 3 | First |

The minimum number of replications means the lowest number consistent with a reasonably simple analysis of the results. The fractional loss of information on the interactions which are confounded is kept as small as possible; but the wisdom of confounding some first-order interactions seems particularly to depend, in any application, on the experimenter being confident that the gain in efficiency from using the smallest possible block size will offset the quarter complications, which include adjustment of the treatment means in two-way summary tables of the results, and sometimes in a lack of symmetry unless more replications are used.

Full details of design and statistical analysis of each new type are given. M. S. B.

870.

TSAI, H. and

519.24:631.421:633.11

CHOW, C. Y.

Studies on field plot technique in wheat.

Chinese J. Sci. Agric. 1943 : 1 : 117-18.

Investigations have been made to determine the most efficient size and shape of plot, and the most suitable number of replications. Systematic and randomized distributions of replicated

plots were compared, and a study was made of the pseudo-factorial and incomplete block methods for testing a large number of varieties.

Percentage standard error per plot was found to decrease gradually with increase in plot size, the rate of reduction being very slight as the plot becomes larger. For any given plot size, long narrow strips or plots give greater precision than short wide ones. Square blocks eliminate soil heterogeneity more efficiently than rectangular and narrow ones. As the area of block is increased, shape of block is the most important factor in determining efficiency. Increasing the number of replications to more than six was found to have little effect in reducing error. The Latin square method is regarded as a better design than the randomized block, when the direction of the fertility gradient is unknown, as is usually the case. The incomplete randomized block method is recommended particularly in pure line selection and tests of more than twenty-five varieties.

871. TEDIN, O.

519.271.3

Small samples of a Poisson series.

Hereditas, Lund 1945 : 31 : 238-40. (Abst.).

The index of dispersion $\chi^2 = \frac{S(x - \bar{x})^2}{\bar{x}}$ for samples from a Poisson distribution does not follow the standard tabulated distribution for small values of the population mean m . The actual frequency of the value $\chi^2 = 0$ is calculated for $m = 0.5, 1.0$ and $2.0, n = 2(1) 10$, and shows that the tabulated distribution greatly underestimates the frequency of low values when m is small and n not sufficiently large. For $m = 2, n = 4$, the actual and tabulated distributions are compared in detail. The agreement is fair but not good. Evidence is presented to suggest that even when m and n are small the usual χ^2 test may be applied to the sum of a number of χ^2 indices of dispersion obtained from individual samples of size n , provided that there are altogether more than 15 degrees of freedom. Samples, all the variates of which are zero, obviously present difficulties in a comprehensive test of sampling technique. J. O. I.

***BREEDING 575**

872. BACKE, H.

575(43)

Carl Sigismund von Treskow-Friedrichsfelde-Stiftung. (The Carl Sigismund von Treskow-Friedrichsfelde Foundation).

Z. Pflanzenz. 1941 : 24 : 134-35.

The erection is announced of the Carl Sigismund von Treskow-Friedrichsfelde Foundation, which is to furnish an annual prize for achievements in plant breeding.

873.

575:633(41.6)

Thirteenth annual report of the Minister for Agriculture, Eire 1943-44.

Dublin 1944 : Pp. 159 + 77.

Wheat

The variety Ironmaster x Pajbjerg No. 4 is resistant to yellow rust, and is a very prolific variety when grown under conditions of high fertility. The cross Ironmaster x Deprez No. 80 has given selections which have short straw, high resistance to yellow rust, winter hardiness and very vigorous growth. Crosses between a rust resistant spring wheat, April Red-Ironmaster-Marquis, and Atle and Diamant have also given rust resistant forms that are promising in other qualities.

Oats

A new hybrid from the cross Glasnevin Ardri x Glasnevin Success has shown very satisfactory yields. This hybrid resembles Glasnevin Ardri in growth habit, but is evidently superior in yielding capacity and size and plumpness of grain. Promising selections have been obtained from the crosses Binder x Glasnevin Success and Binder-Onward x Star.

Barley

The Danish varieties, Kenia and Maja, have been crossed with Archer 37 No. 3 and other varieties. Prolific short strawed selections have been obtained.

Grasses and Clovers

Work on the production of improved strains of perennial rye grass, cocksfoot and red and white clover is being continued.

* General studies, see also individual crops.

Tomato

Further crosses were made which included commercial varieties and the Canadian types All Red and Redskin. The hybrid yields were below those of the better parents, and the hybrid vigour did not exceed that of the parents. The promising results already reported from crosses between heavy cropping commercial forms, together with the effects of inter-crossing, are receiving further study.

Work was continued with the object of obtaining a variety combining heavy cropping with resistance to leaf mould (*Cladosporium fulvum*). Two strains are promising. F_1 families between Vetomold and susceptible varieties showed a high degree of immunity.

Preliminary experiments on vernalization of seed were carried out. In the early ripening Potentate the total yield was increased by 10%. Late maturing varieties showed a negative response to the treatment.

874.

575:633(47)

(A meeting of the active members and directors of institutes of the Lenin Academy of Agricultural Sciences).

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : No. 1 : 42-47.

Among the subjects discussed at the meeting were Lysenko's method of increasing the germination capacity of seeds by subjecting them to certain conditions of temperature and aeration. Sowing sugar beet in summer was recommended; the method enabled yields up to 250 centners per ha. to be obtained, and ensured a uniform stand of seedlings in 4 or 5 days after sowing. Varieties of soya bean suitable for forage are being bred. Some difficulties of defining the type were discussed in connexion with clover.

I. Z.

875. *EĬHFELJD, I. G.

575:633(47)

(The establishment of food-production in the far north).

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : No. 1 : 3-8.

The cultivation of crops in the Arctic Circle has been made possible by certain favourable factors. Among such factors are the prevailing conditions of light and temperature which so influence phasic development that earlier maturity is obtained; it has, for example, been possible to grow spring wheats and barleys from the south which ripen sooner at Hibiny than in the Kuban. Species have undergone fundamental changes during the course of several generations; the sudden change of environment when crop varieties are transferred to northern latitudes has so altered the mechanism of inheritance that even firmly established characters have been rendered pliable. Thus within a single plant or even a single ear, grains may be either awned or awnless, or the rows of grain double or single. Much of the adaptation to cold proceeds naturally. Nevertheless mass and family selection and intervarietal hybridization among potatoes, cabbages and other vegetable crops have greatly hastened the development of characters favourable to growth under Arctic conditions. Potato hybrid varieties have been produced which form tubers at unusually low temperatures. Sexual and vegetative hybridization of tomatoes at Hibiny has resulted in the production of 30% red fruit in the open at a temperature of 10°-12° C.

876. KRYLOV, A.

575:633(47)

(Experience gained in the course of work at the Kamunno-Stepnaja Station).

Socialističeskoe Seljskoe Hozjaistvo (Socialistic Agriculture) Moscow 1944 : No. 1 : 35-43.

This is a brief historical survey of the activities of the above station, which was founded in 1892 by Dokučayev. During 1943 the station produced and delivered to the district seed stations and to the state 8511 centners of élite seeds of 26 varieties of cereal and herbage plants. One variety of winter rye, two of peas, and one each of lentils and vetches passed the state tests and have been allocated to several provinces of the U.S.S.R. An original variety of lucerne "yellow hybrid 600" was produced which is salt resistant and yields 30.5 % more hay than the standard Grimm-Zuikovich breed.

* An extended abstract of this paper is on file at the Bureau.

877.

Försöksdag på Ultuna. (Research day at Ultuna).

Lantmannen 1944 : 28 : 689-90.

The demonstrations included some winter wheat crosses: Gluten x Ergo, which is meant to combine the quality of Gluten with the yield of Ergo, Gluten x Åring, Anker x Svea II and the Ultuna land wheat, which had a weak straw and a smooth ear. The rye plots showed no lodging though Sangaste was over 2 m. long.

The white oat Sol II and the black oat hybrid Extra Klock x Engelbrekt II were new. There was also a new white vetch, and also a new fodder pea, a Torsdags II x Solo cross. (See also *Plant Breeding Abstracts*, Vol. XV, Abst. 531).

878. ÅKERMAN, Å.

575:633(48.5)

Det mest aktuella på årets försöksfält i Svalöf. (The most important information concerning this year's experiment plots at Svalöf).

Sverig. Utsädesfören. Tidskr. 1944 : 54 : 221-27.

This paper takes the form of a running commentary by the director of the Association on the demonstration plots at Svalöf on the occasion of the annual meeting.

Vernalization of *Taraxacum Kok-saghyz* and of sweet lupin was found to increase the germination capacity of the former crop and to induce earlier ripening in the latter.

Three varieties of potatoes in the wart disease trials have equalled Early Puritan in earliness and gave equal or even higher yields; their flavour has also been adjudged good by many.

Diploid and tetraploid forms of rape, winter turnip rape, white and black mustards, Indian mustard and oil radish [*Raphanus sativus* var. *sincensis*] are being studied, together with inbred material. The object is primarily to produce amphidiploids. By this means it may be possible to synthesize certain existing species as well as produce entirely new ones. H. N. Frandsen in Denmark has already obtained a new Indian mustard by that method and there is a prospect of being able to produce new forms of common rape or at least types approximating thereto.

Yield trials of poppy, rape and winter turnip rape and a large collection of breeding material of oil crops and flax are in progress. Among new oat varieties of the central Swedish type from Ultuna some have proved superior in grain quality to Klock II (Bell II) and Engelbrekt II and some are of value for cultivation in Norrland, e.g. Orion III from Guldregn (Golden Rain) x Orion II], which is as early as Orion II but has stiffer straw and a better quality of grain.

In the poppy experiments, specially successful this year, varietal differences are clearly seen.

Soya bean is represented at Svalöf by a small comparative trial, the main breeding material being at Ugerup.

Trials with autumn rape and turnip rape showed that the former crop can be protected from the pollen beetle by early sowing. Moreover, the new autumn rape 01 was less subject to attack than other lines of Svalöf's Senraps (Svalöf Late Rape).

Comparative variety tests of spring oil crops included varieties from X-irradiated material and one such line No. 107 of Regina spring rape has shown more rapid growth and earlier flowering than the parent variety as well as being more resistant to the pollen beetle. Some interesting white mustard lines have also been obtained after X-irradiation, e.g. Nos 154 and 161.

No. 173 in the same experiment is a black mustard from Sofia, distinguished by its earliness and vigorous development.

Interesting tetraploid autumn rape and autumn turnip rape as well as white mustard and spring rape forms are being raised. Some white mustard lines with high chromosome number show promise, but the tetraploid autumn rape seems too sensitive to frost for use in practice.

Among the new winter barleys, Nilsson-Ehle's hardy and high yielding Sv 39/16 (from Mansholts x Pommerskt Nordland) is specially mentioned.

Various types of rye-wheats are also being raised from foreign rye-wheats or from crosses between Swedish wheats and specially selected self-fertile inbred lines of rye. New varieties of rye-wheat are also being tested at Ugerup.

The most promising tetraploid ryes comprise Vasa II and Stål (Steel).

Experiments on the causes of degeneration accompanying inbreeding, and the effects of hybridization in rye are also in progress.

In the Möllegård and Heleneborg area winter wheat suffered severely by insufficient resistance to *Cercospora herpotrichioides*.

New successful varieties combining high yield with reliable winter hardiness and now nearing the end of their trials are: Skandia III, line 01092, from a hardy elite of Skandia I (cf. *Plant Breeding*

Abstracts, Vol. XV, Abst. 173); variety No. 01293b₃ (from Åring I x Skandia I); Nos 01281 and 01282 (from Sol II x Standard) and the new variety No. 01430 [from Åring I x Drott (King)]. All these are competitors of Skandia II and Eroica.

Among the wheats primarily intended for southern Sweden there are several specially hardy forms for central Sweden, e.g. U.01390 and U.01391 (from Ergo x Gluten), the Värmland variety Vrm. 01134 which is regarded as a new Pärll (Pearl) wheat, and the Svalöf wheat No. 01420 (from Skandia II x a line from Västergötland land wheat).

The work on rye is described elsewhere (see Abst. 980). The need was stressed for experiments on the estimation of the importance of varietal differences in straw stiffness.

The spring wheat plots included the new élites of Progress and the new variety 01050b (from Blanka x E. Kolben II), variety 01080 (from 10015 x Diamant II), remarkable for its high yield and baking quality, and the new Diamant wheat 01070 (from Diamant II x Diamant I), raised at the Västgöta Branch Station, which appears to combine the good qualities of Diamant I with better drought resistance and is less exacting in regard to its environment.

The barleys comprised the new 2-rowed Ymer Sv 40/13b₁ which gives practically the same yield as Maja and equals Kenia in stiffness of straw, early ripening and apparently also in malting quality, and has surpassed Kenia in yield of grain by about 56%, and Balder and Freja by about 2%. There are also several new élites of Ymer. Other new barleys are lines from Isaria x Opal, crosses from the Kalmar Branch Station which have done well in trials and have good malting qualities. Tetraploid hybrids and X-ray mutants, some of which showed very early development, were also exhibited.

The oat material of interest comprises: Vg. 01488 from the cross Stjärn (Star) x Guldregn (Golden Rain), which has surpassed both Seger (Victory) and Stjärn and is likely to be a competitor of Sol II; the new 01430 from the cross Sölv (Silver) x Örn (Eagle); and the early variety Vrm. 01466 (from Seger x Gopher), a possible competitor of Primus and Bambu.

Two new culinary pea varieties 03101 and 03023 and a relatively early fodder pea 01080 (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 769) were among the demonstration plots which also included many new lines of brown seeded beans and field beans.

Flax was represented by (1) some new hybrid varieties with improved stiffness of straw, (2) an X-ray mutant from Concurrent with a low chlorophyll content but of practical value; and (3) several promising new lines of linseed flax raised at Svalöf on the Kalmar Branch Station, in addition to the new Atlas.

New strains of different Svalöf varieties of root crops are undergoing tests and experiments are in progress to determine the stimulation due to hybridization in different crosses and to study the effects of mass selection in breeding root crops.

The Chromosome Division is engaged in a study of forms of various crop plants with reduplicated chromosome number and of their practical value.

About three different lines of tetraploid red clover are being grown and high chromosome clover strains have done well in trials against corresponding low chromosome strains.

Promising high chromosome forms of timothy and white mustard have been produced and the fifth generation of high chromosome hybrids of flax is now undergoing selection.

In quality studies of various crops, the Chemistry Division and the Cereal Laboratory of the Association are investigating *inter alia* (1) the causes of differences in crude protein content in varieties of wheat and barley; (2) differences in starch content and in vitamin C content of potatoes; and (3) differences in the active carotene content of herbage plants.

575:633(48.5)

879. ÅKERMAN, Å.

581.143.26.03:633.367

Några viktigare produktionsmedels utnyttjande efter kriget. (*The exploitation of some of the more important natural resources after the war*).

Sverig. Utsädesfören. Tidskr. 1945 : 55 : 14-19.

In this paper, written from the standpoint of a rational development of agriculture and plant cultivation in particular, agricultural requirements are stated to include: (1) for cereals, increased yields, stiff straw, earliness, high quality, slow germination, and resistance to rust and other diseases; (2) for root crops, higher yields, combined with higher dry matter content, and a type easily lifted; (3) for herbage plants, higher yielding capacity and quality, and, in particular, strains of clover, timothy, etc., that are more persistent; (4) for sweet lupin, earlier forms that are more reliable in yield (vernalization can be used to shorten the vegetation period); and for oil bearing plants, increased yields.

Cultural measures to increase production are also discussed.

880. L.J. . . . , E. 575:633(48.5)
Sveriges Utsädesförenings årsmöte. (**Annual meeting of the Swedish Seed Association**).
Sverig. Utsädesfören. Tidskr. 1944 : 54 : 228-35.

In addition to the routine discussions of the meeting, mention was made of the new flax laboratory, funds in aid of the Association's work, the acquisition of new buildings, etc. at various branch stations, the retirement of Nilsson-Ehle from the directorship, and acknowledgements made to E. W. Ljung for his services to the Association, including over 40 years' successful work on rye breeding (cf. Abst. 980).

881. ÅBERG, E. 575:633(73)
Studies of crop production in the United States 1940 to 1943.
Publ. Inst. Plant Husb. Roy. Agric. Coll. Sweden 1944 : No. 1: Pp. 87.

This publication describes the production and breeding of crops and a number of outstanding fields of scientific work in crop production and breeding in the United States, which are likely to be of interest to the breeder and farmer in Sweden.

882. LINDSEY, A. H. 575:633(74.4)
Annual report of the Massachusetts Agricultural Experiment Station
—1943-44.
Bull. Mass. Agric. Exp. Sta. 1944 : No. 417 : Pp. 78.

Maize

Single crosses involving all possible combinations of 14 inbred lines were tested. An early hybrid produced by the double cross (CC4 x CC8) x Quebec (83 x 9) has given satisfactory yields.

Rutabaga or Cape Turnip

Bristol White and Waltham Yellow are two new varieties, both segregates from White Cape strains. Bristol White has a white or very light purple shoulder that is unusually smooth, a short neck, and very few lateral roots. Waltham Yellow has yellow flesh and a green shoulder.

Tobacco

New strains of Havana Seed, which produces high yields of good type and quality in soils infested with *Thielaviopsis*, are in course of production. They show particular improvement in leaf conformation and earlier maturity.

Apple

Lethal incompatibilities between clonal stocks and varieties were investigated. Selection of the so-called bud sports of the McIntosh apple was continued.

Raspberry

The length of the rest period was studied in 6 varieties. An estimate of winter injury was made in 8 varieties in spring 1943 and 1944, as expressed by the percentage of total cane length injured.

Blueberry

A study was made of the severity of mummy berry in a number of varieties. The effect of winter injury was observed. Among budded branches of U.S.D.A. seedlings that have produced berries, F-72, R-86, V-20 and GN-87 show promise.

Onion

F₂ progenies from a cross between White Persian with light leaf colour, and Ebenezer with yellow skin and dark leaf colour, gave a close ratio of 3 yellow : 1 white skin bulbs. Dark leaf colour was dominant over light.

Lettuce

The new variety, Waltham Early Forcing, has been produced from the cross Bel-May x Cheshunt Early Giant. In comparison with Bel-May it grows more quickly, has a darker green colour, better development of bottom leaves, and bolts less rapidly. The plants are smaller than those of Bel-May, and the leaf overlap of the head is less good.

Celery

Promising results have been obtained from the cross Summer Pascal x Cornell No. 19.

Cucumber

The average yield in 1943 of 4 hybrids obtained by crossing selfed lines was 11% greater than that of their respective parents. In 1944, an increase of 30% was obtained. Certain combinations of selfed lines were much better than others. The hybrids have produced an increase not only in yield but also in percentage of No. 1 fruit.

883.

575:633(75.6)

Research and farming 1943.

66th Ann. Rep. N.C. Agric. Exp. Sta. 1943 : Pp. 122.

Wheat

Promising new strains have been developed from a cross between Nittany and Malakof.

Maize

Several new double cross hybrids have been developed. Two yellow hybrids, N.C. 1028 and N.C. 1032, have exceptionally strong stalks and root systems. The two best white hybrids, N.C. 1111 and N.C. 1114, are high yielding and tolerant to insect pests.

Lespedeza

Climax is a new variety selected from Korean. It is adapted as a hay variety, and matures later than Korean. Other new strains have given high yields.

Cotton

Advanced inbred strains show differences of 15% in fibre diameter, while intervarietal differences for the same property reach 20%.

Inbred lines isolated from Stoneville 4B, Stoneville 2B and Mexican varieties have good fibre quality, but most of these lines are less productive than the varieties Coker 100 and Deltapine. Segregation and recombinations of fibre characters were observed in hybrid progenies. Sister lines showed wide differences in fibre strength and X-ray angle. A selection from a four-way cross had a finer Hertel fibre index than either parent.

Many new strains of Coker 100 and Coker 100 Wilt were included in tests for adaptability.

Inheritance of fibre strength has been studied. The data obtained suggest that fibre strength is inherited independently of yield and staple length. The property appears to be correlated with the arrangement of the cellulose, as determined by the X-ray diffraction pattern, and with narrow diameter.

Tobacco

The new variety of flue cured tobacco, No. 402, derived from a cross between No. 400 and Jamaica, has produced high yields of good quality leaf. Its compact growth habit appears to give the variety the ability to withstand strong wind.

Dewberry

A selection has been obtained with fruit three or four times the size of those of the chief commercial variety, Lucretia. The fruit has good dessert quality.

Tomato

Selections resistant to Granville wilt (*Bacterium solanacearum*) have resulted from the crosses Louisiana Pink x T 414 (P.I. No. 3814, a strain of *L. esculentum* from Puerto Rico) and T 414 x Devon Surprise.

884. KING, G. H.

575:633(75.8)

Twenty-fourth Annual Report.

Bull. Ga Coastal Plain Exp. Sta. 1944 : No. 40 : Pp. 112.

Maize

In the maize breeding programme, which has as its objective the production of hybrids adapted to conditions in Georgia, special emphasis has been placed upon the isolation of inbred lines resistant to insects and diseases, particularly with long husks for protection against the weevil.

Millet

Late maturing strains have been obtained of cattail millet.

Forage grasses

Breeding and selection were continued in a number of grasses, including the Bermuda, Sudan and Bahia grasses.

Cotton

Crosses have been made between Tifton Station 21, a high yielding wilt-resistant variety, and a number of early types. Several lines have been obtained which evidently combine the yield and quality of Tifton Station 21 with the earliness of the other parent.

In an attempt to increase the staple length of Gaddis, a number of crosses have been made between this variety and other Sea Island strains and hybrid lines. Several hybrids have shown promise in the F_2 generation.

No correlation was found between either boll-weevil damage or yield and so-called earliness or lateness of fruiting.

Peanut

The new hybrid strains, 207-3 and 18-59, show promise. The two varieties give yields comparable with those of the best strains of Spanish peanut. The strain 207-3 has a higher oil content than the Spanish, 18-59 produces more and better hay, and is white-seeded.

Water-melon

Sweet wilt-resistant strains have been obtained which, in addition, evidently have some resistance to anthracnose. Strain S306 is the most promising, although the rind is weak; its sugar content is high, the flesh compact and fine-grained. Strain S308 is similar to S306, but less valuable. Strain S307 has a tough rind but shows a tendency to develop white heart. A selection from S307, free from white heart, has been obtained. A selected back-cross of Georgia Wilt Resistant with Colocynth was again back-crossed with a sweet wilt-resistant strain (S308) to produce a small, ice-box sized melon resistant to wilt.

885. BLIZZARD, W. L. and
HAWKINS, L. E.

575:633(76.6)

Science serving agriculture. Part I.

Bienn. Rep. Okla. Agric. Exp. Sta. 1942-1944 : Pp. 95.

Maize

Over two hundred inbred lines are under observation or being tested for use as parent material in the production of hybrids adapted to conditions in Oklahoma.

Sorghum

A new variety, Sumac No. 1712, has out-yielded Atlas in both grain and forage. The new strain Oklahoma No. 1 Darso is equal in other qualities to any other Darso strain now available and has a wide area of adaptation in the state; it is resistant to *Pythium* root rot. Breeding work shows promise of developing an improved sweet sorghum, with medium maturity, a single stalk, good standing ability and a high percentage of sugar and yield of juice. A pure strain of African millet has shown superior resistance to chinch bug.

Sweet Potato

Promising new lines are now under test.

Cotton

New strains are described. Stoneville 62 ranked as second in yield in extension tests in 1943. Oklahoma 92 is an improved strain of Oklahoma Triumph 44; it is extremely early. Oklahoma Special, selected from Acala 5 has a higher yield and is more uniform than Acala 5. Acala S92 is a strain reselected from Acala 5; it has a medium to large boll, and is medium to early maturing. Acala 2496 is a selection from New Mexico Acala 1757, and produces a medium boll with a fine staple. Other improved strains show promise of good yield and better lint quality.

Tomato

An F_1 hybrid produced 36% more than the highest yielding standard variety in 1944.

Beans

Several new hybrid lines of snap beans are being tested for yield.

886.

575:633(79.7)

Fifty-fourth annual report for the fiscal year ended June 30, 1944.

Bull. Wash. Agric. Exp. Sta. 1944 : No. 455 : Pp. 168.

Wheat

Genetic studies in winter wheat were mainly concerned with the inheritance of quality in two crosses, judged by pearling and dough-ball tests. The progeny of numerous crosses are being selected for disease resistance and other desirable qualities, the pedigree and back-cross methods being employed to obtain desired combinations of characters. Further selections were made from advanced progenies of crosses between wheat and *Agropyron elongatum*. The more wheat-like forms have a weaker perennial habit than the intermediate selections but some appear to have the rust resistance of *A. elongatum*. Grain quality in generally poor.

In spring wheat further studies were made of the inheritance of reaction to stem and leaf rusts and mildew in crosses of Hope and a selection of H 44 with Federation 41. Hope and the derivative of H 44 carry identical linked genes for resistance to leaf rust and mildew. Genes determining

reaction to stem rust were independently inherited. Crosses have been made with the object of breeding lines combining the disease resistance of Hope and a selection of H 44 with the desirable characters of locally adapted varieties.

In a study of the pathogenicity of bunt and smut two selections from the cross Rex x Rio were found to be highly resistant to all races of bunt; selection Washington 6 was resistant to all but two races. Hybrid selections were highly resistant to flag smut in greenhouse tests.

The new variety Orfed shows promise as both a winter and spring wheat.

Oats

The variety Ventura was highly resistant to all but three of the 26 races of *Ustilago Avenae* and *U. levis*. Several selections from the cross Victoria x Richland were highly resistant to races virulent on the variety Victoria.

Barley

Crosses of winter barley have been made with the object of breeding lines superior to the commercial varieties, White Winter and Olympia. In spring barley, linkage studies of several abnormal characters have been continued. The gene for light green 4, lg_4 , was located on chromosome I. F_3 and F_4 lines of the cross Atlas x Barbless provided selections combining high yield, stiff straw, smooth awns and good malting quality.

Forage grasses

Inbred plants of *Arrhenatherum elatius* showed considerable differences in self-fertility.

The reaction of strains of *Bromus marginatus* to head smut (*U. bullata*) was studied. Their reaction varied from complete resistance to high susceptibility. In general *Elymus canadensis* was more susceptible than *B. marginatus*.

Apricot and peach

Varietal differences were found in an analysis made in several varieties for ascorbic acid content before and after canning.

Raspberry

The raspberry breeding programme has as its objectives the development of superior extra early and autumn fruiting varieties, varieties better adapted to conditions in south-west Washington and breeding stock showing improved resistance to the mosaic transmitting insect *Amphorophora rubi* Kalt.

Blueberry

Cytological and taxonomic studies of native species of *Vaccinium* have revealed the following chromosome numbers: diploid ($n = 12$) *V. scaparium* Leib., *V. Myrtillus* L., *V. parvifolium* Smith, *V. Chamissonis* Bong., *V. caespitosum* Michx., *V. occidentale* Gray and *V. ovatum* Pursh; tetraploid ($n = 24$) *V. globulare* Ryd., *V. membranaceum* Dougl., *V. ovalifolium* Smith, *V. deliciosum* Piper, *V. uliginosum* L. and *V. quadripetalum* (Gilib) Schultz.

The seedling progeny of several interspecific crosses have been obtained.

Strawberry

Hybrid selections for fruit qualities, yield and resistance to yellows and root rot have been made. Relative susceptibility to root rot and other diseases has been investigated in a considerable number of varieties and hybrids.

Cabbage

A study of varietal resistance to certain virus diseases is in progress.

Pea

Various crosses have been made to obtain new varieties showing good quality, high yield, earliness, disease resistance, and longer vines to facilitate combine-harvesting.

Many varieties have been tested for reaction to *Ascochyta* species. No varieties are immune, but certain sweet and field varieties show a high degree of resistance.

*GENETICS 575.1

887. DUNN, L. C. and

GLUECKSOHN-SCHOENHEIMER, S.

575.115

Dominance modification and physiological effects of genes.

Proc. Nat. Acad. Sci. Wash. 1945: 31: 82-84.

An account is given of the varying behaviour in respect of dominance exhibited by the *Sd* gene in mice, when present in different genetical environments. The importance of such observations for an evaluation of Fisher's theory of the evolution of dominance is indicated.

* General studies, see also individual crops.

575.12:575.148:633.11

888. *PUKHALSKY, A.

575:633(47)

(The efficiency of some new methods in seed breeding work).

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : No. 4 : 36-42.

In the wheat *Erythrospermum* 0917, yields of 16.96 to 17.21 centners per hectare were obtained from intravarietal crossing as compared with 16.18 c. per ha. from uncrossed seed.

For cross-pollinated plants such as buckwheat and rye, sowings are made of a given variety in close proximity to a number of other varieties. In this way the yielding capacity of Lisicin's rye was raised by 4-8 c. per ha. The yield of Bogatyry buckwheat was increased by 1.2-1.8 c. per ha. Selection of the best families can effect quite material improvements in a variety; millets with improved yielding ability have been selected in this way. Improvements in winter hardiness, grain weight and protein content have been produced in rye by these methods, and in linseed increased oil content has been attained.

889. IVES, P. T.

575.123:575.113.7:575.115:575.41

The genetic structure of American populations of *Drosophila melanogaster*,

Genetics 1945 : 30 : 167-96.

A study of wild populations of *D. melanogaster* collected in different areas in the United States suggests that *D. melanogaster* breeds in large populations in America, in contrast to the smaller populations of other species in America and *D. melanogaster* in western Russia. The effect of population size upon the evolutionary trend is discussed.

Data are presented showing that temperature shock may act as a natural agent of selection of dominant genes in heterozygotes.

890. GOWEN, J. W.

575.125:575.11

An analysis of the genic or cytoplasmic basis of heterosis.

Genetics 1945 : 30 : p. 7. (Abst.).

A study of hybrid vigour in *Drosophila*, as indicated by egg production in different geographical races, revealed a genetic rather than a cytoplasmic origin of the phenomenon. Observation of the effect upon the total hybrid vigour of the redistribution of chromosomes indicated that heterosis was due to a fairly large number of genes distributed at random over the chromosome pairs.

891. FRIMMEL, F. v.

575.125:633

Die Bedeutung der Züchtung von Heterosissorten. (The significance of breeding heterotic varieties).

Z. Pflanzenz. 1941 : 23 : 638-60.

This review on the utilization of heterosis by plant breeders opens with a general account of hybrid vigour and the depression in vigour often found during inbreeding. The hypotheses put forward to explain heterosis are discussed under three headings: (a) those which posit an interaction between the chromosome sets of either parent giving rise to the production of stimulatory substances, (b) those which suggest a comparable interaction between the male genome and the female plasma, and (c) the various genetical hypotheses which attribute hybrid vigour to a favourable combination of growth determining genes.

The technique of large scale production of heterotic varieties is considered, and the following crops are then treated in turn: poplar, walnut, larch, tobacco, tomato, egg plant, paprika, maize, spinach and rye. Details are given of heterotic combinations of tomato varieties. Hybrid vigour does not seem to offer much promise in the breeding of cucurbitaceous fruits. Final sections of this paper allude to the application of heterosis in floriculture.

892. MARSHAK, A. and

BRADLEY, M.

575.17:537.531:539.185.9

Relative sensitivity of chromosomes to neutrons and X-rays. III. Comparisons of carcinoma and lymphosarcoma in the rat.

Proc. Nat. Acad. Sci. Wash. 1945 : 31 : 84-90.

Evidence is given from neutron and X-ray experiments to support the conclusion that the "genic constitution" and chromosomes of living cells undergo essential changes during ontogeny and tumour formation.

* An extended summary of this paper is on file at the Bureau.

893. SONNEBORN, T. M. 575.182
Evidence for a bipartite structure of the gene.
 Genetics 1945 : 30 : 22-23. (Abst.).

Data obtained indicate that the cytoplasmic factor, κ , required in addition to gene *K* to determine the "killer" character in variety 4 of *Paramecium aurelia*, occurs in the macronucleus as well as in the cytoplasm.

894. ZIMMER, K. G. and
 TIMOFÉEFF-RESSOVSKY, N. W. 575.24:537.531
 Nachtrag zu der Arbeit "Über einige physikalische Vorgänge bei der Auslösung von Genmutationen durch Strahlung." (**Supplement to the work "Certain physical processes and the production of gene mutations by irradiation"**).
 Z. indukt. Abstamm. -u. VererbLehre 1942 : 80 : p. 619.

This note clarifies the method used for dosage measurements in the paper cited (cf. *Plant Breeding Abstracts*, Vol. XIII, Abst. 446).

895. SELL-BELEITES, I. and
 CATSCH, A. 575.243:535.61-31
 Mutationsauslösung durch ultraviolett Licht bei *Drosophila*. I. Dosisversuche mit filtriertem Ultraviolett. (**Mutation induction through ultra-violet light in *Drosophila*. I. Experiments on dosage with filtered ultra-violet light**).
 Z. indukt. Abstamm. -u. VererbLehre 1942 : 80 : 551-57.

An increase in the mutation rate of sex-linked genes in *Drosophila* after irradiation with ultra-violet light is reported. The mutation rate was found to increase linearly with dosage at first, although falling away at higher dosages. The mechanism of mutation induction by ultra-violet light is discussed, and compared to the mode of action of X-irradiation.

896. KNAPP, E. and
 KAPLAN, R. 575.243:537.531
 Beeinflussung der Mutationsauslösung und anderer Wirkungen der Röntgenstrahlen bei *Antirrhinum majus* durch Veränderung des Quellungszustandes der zu bestrahlenden Samen. (**The influence on mutation induction and other effects of X-irradiation in *A. majus* of alterations in the type of soaking applied to the seed about to be irradiated**).
 Z. indukt. Abstamm. -u. VererbLehre 1942 : 80 : 501-50.

The object of the experiments described was to determine the effect of X-irradiation on the mode of development and induction of monomeric gene mutations in seeds of *A. majus* subjected to various treatments.

It was found that the seeds were more susceptible to X-ray treatment after they had been moistened for 8 hours. If, however, the seeds were dried after this preliminary 8-hour moistening they were less susceptible to X-irradiation although more susceptible than previously unmoistened seeds. The method of moistening was also important. Seeds moistened with damp filter-paper suffered greater injury than those submerged in water, while the latter appeared to give rise to a larger proportion of gene mutations; the latter result, however, was not certain. The mode of seed pre-treatment also influenced the type of mutation. Unmoistened seeds gave rise to a higher proportion of testa mutations (Saatschalenmutation) than mutations affecting the growing plant (Freilandmutation), while the converse relation held for moistened seeds.

From these observations, the authors suggest that the nature of the effects brought about by X-irradiation depends on the water relations of the irradiated tissue. The elucidation of the mechanism of these effects is attempted by discussing the effective volume (Wirkungsvolumen) of the regions susceptible to X-ray bombardment (Treffbereich). This effective volume is believed to be affected by the adsorption of water by hydrophilic substances and also, more indirectly, by the gaseous environment of the cell.

897. *KELLER, B. 575.3(47)
(Genetics on new principles).
 Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : No. 10 : 3-10.

An extensive review is given of Lysenko's recent work entitled "Inheritance and its changeability" (see *Plant Breeding Abstracts*, Vol. XV, Abst. 117), with many original observations of the reviewer. For instance, it is stated, certain solonchak soils contain so much soluble sodium chloride, sodium sulphate and other salts that most plants will not grow on them. Certain species were found however which at first would just tolerate these soils and later came to be intolerant of any other. There is little doubt that in the evolution of these salt tolerant plants a change was effected in their type of assimilation and metabolism; this produced a very original type of vital processes and an accompanying change in the morphological properties of the plant concerned.

898. IGNATIEV, M. V. and SHAPIRO, N. I. 575.41:57.087.1
Ways of stabilization of genotype. I. Selection of stable allelomorphs.
 C.R. (Doklady) Acad. Sci. U.R.S.S. 1944 : 45 : 206-08.

The selection of stable genotypes may proceed along two lines simultaneously (1) by selection of stable alleles, and (2) selection of genes modifying mutability. The authors present a summary of a biometric analysis of the possibility of the ways of selection of the most stable alleles in a given population.

ORIGIN OF SPECIES 576.1

899. QUINTANILHA, A. 576.16
 632.4:576.16
 O problema da delimitação e origem das espécies do ponto de vista da biologia experimental. **(The problem of the delimitation and origin of species from the view-point of experimental biology).**
 Bol. Soc. Brot. 1943 : 17 : 159-65.

The way in which systematics has gradually changed from a purely descriptive to an experimental science is discussed, the importance of the contributions made by genetics, cytology and interfertility studies being emphasized. In the Hymenomycetes considerations of interfertility have almost invariably coincided with the purely morphological criteria in considering the validity of species but have in certain difficult cases helped considerably towards a clarification of the situation.

†CYTOLOGY 576.3

900. BRESLAVEC, L. P. 576.3
(The rise of the cell theory).
 J. Gen. Biol. 1944 : 5 : 96-122.

This is an up-to-date review on the subject. The author traces back the first descriptions of the cellular structure of plants to Hooke, Malpighi and Grew at the end of the seventeenth century. The accumulation of knowledge proceeded parallel with the improvement in the construction of the microscope and of microscopic technique. Discussing in some detail the work of English, French, German and Russian authors of the eighteenth and nineteenth centuries, before and after the appearance of the treatises of Schwann and Schleiden, the author stresses the point that neither of the latter investigators can be recognized as a founder and originator of the cell theory. They merely summarized the contemporary knowledge and popularized the already existing theory. In subsequent years a large body of investigators claimed to prove the erroneousness of many of the views advanced by Schwann and Schleiden in their books; and the cell theory, as we know it to-day, is the result of collective effort by many generations of scientists. H. F.

* An extended summary of this paper is on file at the Bureau.

† General studies, see also individual crops.

901. DELLINGSHAUSEN, M. VON. 576.311
 Zellphysiologische Untersuchungen an Epilobien mit genetisch verschiedenen Plasmen. (**Researches into the cell physiology of *Epilobia* with genetically different plasmata**).
 Planta 1944 : 34 : 17-33.

Investigations have been made of the cytoplasm of *Epilobium* varieties which agree in having nuclei of the same genetic constitution but differ in the nature of their plasmata. The following characters of the plasma have been shown to vary between two or more of the varieties examined: permeability to malonamide and monacetin; staining reaction with acid fuchsin, toluidine blue and rhodamine B; and viscosity under varying conditions of temperature and photoperiod.

902. SERRA, J. A. 576.312.32
 Sur la composition protéique des chromosomes et la réaction nucléale de Feulgen. (**The protein composition of the chromosomes and the nuclear reaction of Feulgen**).
 Bol. Soc. Brot. 1943 : 17 : 203-11.

The evidence in favour of the theory that the proteins of the chromosomes are basic is reviewed. The value of the Feulgen reaction is next discussed, and it is shown that a negative result is obtained when it is applied to chromosomes pre-treated with nucleases, even although the pre-treated chromosomes stain clearly with haematoxylin.

These results are held to refute the theory of Stedman and Stedman (cf. *Plant Breeding Abstracts*, Vol. XIV, Absts 17 and 19) that the Feulgen stain is merely adsorbed by an acidic protein chromosomin after being formed, and that the location of the desoxyribose nucleic acid does not correspond to the distribution of the stain.

903. ELVARS, I. 576.312.32:578.6
 On an application of the electron microscope to plant cytology.
 Acta Hort. Berg. 1943 : 13 : 149-245.

A detailed account is given of the technique and usefulness to the cytologist of electron microscopy. The first part of the paper is concerned with technique, especially the various methods of preparing cytological material so that it becomes penetrable by electron beams. Untreated chromosomes are too electron-optically dense for direct observation and must be treated in order to obtain satisfactory electron photographs. The following techniques are described: (1) embedding cytological material in a suitable plastic and grinding down to a thin film, (2) pepsin digestion, (3) papain digestion, (4) trypsin digestion in the presence of lanthanum chloride which forms an insoluble salt with the nucleic acids, (5) treatment with spleen extract containing nucleases; (6) incineration of the material and examination of the ash content, (7) treatment with chromic acid, (8) pre-treatment with KCN, (9) the preparation of micro-nets for mounting, (10) pollen smear preparation, (11) embedding small objects, (12) the use of a mixture of celvacene and cellulose acetate for embedding in order to reduce shrinking, (13) the utilization of electron-optically empty films of evaporated sulphite liquors for mounting, (14) the preparation of beryllium surface replicas, and (15) the preparation of zapon lac replicas.

The reliability of these techniques is considered, also the reliability of the observations made by light microscopy on cytological objects, many of which lie beyond the range of accurate observations. It is concluded that the desiccation involved in electron microscopy and the damage sustained by the cells from the electron beam, do not invalidate the results obtained. On the other hand, optical illusions and psychological difficulties in the interpretation of sense data are believed to detract seriously from the value of high-power light microscopy. Artefacts probably occur to a comparable extent both in electron and light microscopy.

All the author's investigations have been made on the pachytene chromosomes of *Lilium* sp. and the following results are reported. The chromosomes appear to have an aculeate surface, not the smooth surface suggested by light microscopy; this latter appearance is believed to be an optical illusion brought about by the small size of the chromosomes. Longitudinal fibres could be demonstrated in the pachytene chromosomes but no general distinction into two or more parallel strands. The double strand usually described in observations of pachytene chromosomes is again held to be an optical illusion.

Both coiling and differentiation into chromomeres could be demonstrated, and on the basis of this observation the following theory of spiralization is propounded:—

'The chromosomes may be considered as a pile of chromomeres which lie across the chromosome

axis and are polarized, having 'plus' and 'minus' poles which will exert an attraction upon each other in some way analogous to that between magnetic poles. The attraction between plus and minus poles of these 'magnets' would cause them to move towards each other and a coiling of the chromonema thread would be initiated".

Nucleic acids are believed to be largely concerned with the formation of these dipoles.

A final note refers to the cytoplasm which is held to consist principally of a three-dimensional reticulum of protein chains.

904. SCHULTZ, J. and

JOSE, F. S.

576.312.32:578.65

Differentiation of chromosomal proteins by staining techniques.

Genetics 1945 : 30 : 20-21. (Abst.).

Staining methods are described which distinguish the nucleo-protein, the fibrous inter-band and the non-fibrous "matrix" in the salivary gland chromosomes of *Drosophila*.

905. STRAUB, J.

576.312.34

Chromosomenstruktur. (Chromosome structure).

Naturwissenschaften 1943 : 31 : 97-108, 396.

A general review of recent work on chromosome morphology is presented.

The chromosomes are cylindrical bodies which contract during prophase and metaphase by a process of spiralization. During anaphase, the coils of the spirals relax and the chromosomes become longer once again. The length and thickness of the chromosomes of any species are characteristic, but not the direction of the spiral which may change its sense (clockwise to anti-clockwise or vice versa) in successive mitoses, or may even vary throughout the length of a single chromosome.

There is some doubt as to the number of chromonema strands in each chromosome, different authors reporting the existence of 2, 4 or 8 strands respectively.

The distinction between euchromatin and heterochromatin is discussed, also the effects on the nature of chromosome coiling caused by temperature changes and KCN solution. The evidence for the existence of a chromosome matrix is considered and attention given to the problem of the mechanical forces operative in spiralization.

After these observations on the gross structure of the chromosomes, the author turns to questions of fine structure. The importance of correlating genetical and cytological studies in the field is emphasized, also the importance of studying the salivary chromosomes of the Diptera. A distinction can be drawn in the euchromatic regions of the chromosomes between the chromomeres and the intervening fibrils. The former contain thymonucleic acid, a protein of the albumin-globulin type and a histone, the latter consist mainly of an albumin-globulin protein. Heterochromatic regions of the chromosomes contain much thymonucleic acid and are rich in histone. The nucleolus is also rich in histone but contains only a little thymonucleic acid. A short discussion follows on the significance of the heterochromatic regions and the nucleolus as regards the protein metabolism of the cell.

Final sections deal with the biochemistry of nucleoproteins, the nucleic acid cycle, the auto-reproduction of bodies containing nucleic acids and the fine structure of the cytoplasm.

906. BOWDEN, W. M.

576.312.35:582

A list of chromosome numbers in higher plants. I. Acanthaceae to Myrtaceae.

Amer. J. Bot. 1945 : 32 : 81-92.

Chromosome numbers and representative metaphase figures are given for various species of the following genera: (1) Acanthaceae, *Ruellia*; (2) Actinidiaceae, *Actinidia*; (3) Amaryllidaceae, *Manfreda*; (4) Annonaceae, *Asimina*, *Cananga*, *Annona*; (5) Apocynaceae, *Lochnera*, *Vinca*; (6) Araceae, *Arisaema*; (7) Araliaceae, *Aralia*; (8) Asclepiadaceae, *Periploca*; (9) Begoniaceae, *Begonia*; (10) Bignoniaceae, *Bignonia*, *Campsis*, *Chilopsis*, *Kigelia*, *Stenolobium*, *Doxantha*, *Incarvillea*; (11) Cactaceae, *Opuntia*; (12) Caprifoliaceae, *Sambucus*; (13) Commelinaceae, *Commelina*; (14) Celastraceae, *Celastrus*, *Euonymus*, *Pachistima*; (15) Cistaceae, *Helianthemum*, *Cistus*; (16) Compositae, *Baccharis*, *Gerberia*; (17) Coriariaceae, *Coriaria*; (18) Euphorbiaceae, *Euphorbia*, *Manihot*; (19) Fumariaceae, *Corydalis*, *Dicentra*; (20) Hydrophyllaceae, *Hydrophyllum*; (21) Juglandaceae, *Juglans*; (22) Lauraceae, *Persea*, *Sassafras*; (23) Iridaceae, *Sisyrinchium*; (24) Liliaceae, *Anthericum*, *Arthropodium*, *Cardyline*, *Dracaena*, *Hosta*; (25) Lobeliaceae, *Lobelia*; (26) Lythraceae, *Lagerstroemia*; (27) Meliaceae, *Melia*; and (28) Myrtaceae, *Feijoa*.

907. GEITLER, L. 576.35

Die Mechanik der Mitose. (The mechanics of mitosis).

Naturwissenschaften 1943 : 31 : 501-04.

The various stages in normal mitosis are described and considered in relation to possible explanatory theories. It is believed that the movement of the chromosomes must be interpreted as a resultant of attractive and repelling forces operating between the chromosomes themselves and between them and the spindle poles. The importance of the centromere as the actively motile locus of the chromosome and as the region at which the anaphase separation of the chromatids begins is emphasized.

Cell division and chromosome division should be envisaged as related but independent processes as is shown in c-mitosis where chromosomal fission is unaccompanied by cell division. The significance of the spindle in relation to these processes is discussed.

908. EHRENBERG, L. 576.353:633.584.3
- The shape of the spindle at metaphase is conditioned by the shape of its molecules.**

Hereditas, Lund 1945 : 31 : p. 240. (Abst.).

In a series of experiments not yet completed the shape of the spindle at metaphase has been investigated by statistical methods. The material consisted of root meristems of the hybrid *Salix fragilis* x *S. alba*. It was found that the curvature of the outline of the spindle as it appears when the spindle is studied at right angles to the direction of nuclear division is a measurable property.

909. GAULDEN, M. E. 576.354.46
- An experimental study of somatic pairing.**

Genetics 1945 : 30 : p. 5. (Abst.).

An attempt was made to induce somatic pairing in *Crepis capillaris* experimentally. A tendency for homologous chromosomes to pair somatically was observed.

910. LITTLE, T. M. 576.356.5:575.11
- Gene segregation in autotetraploids.**

Bot. Rev. 1945 : 11 : 60-85.

The literature relating to genetic segregation in autotetraploids is reviewed, special consideration being paid to the theory propounded by Mather which allows for the effect of meiotic behaviour on the observed segregation ratios. The difficulties in the way of genetical investigations of tetraploids are discussed.

911. MANGENOT, G. and 576.356.5:581.04
CARPENTIER, S.
Le syndrome mitoclasique. (The c-mitotic syndrome).

C.R. Soc. Biol., Paris 1944 : 138 : 105-07.

A short discussion on the recent French work on c-mitosis is presented, special attention being paid to the three effects distinguished by Gavaudan as tropocinesis, merostathmocinesis and stathmocinesis (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 561). The concepts represented by these terms are held to require further precision. Merostathmocinesis (incomplete inhibition of the spindle) may come about either through the failure of the cytoplasm to behave normally, or through the failure of the nucleus. The latter effect is termed "hemicinesis". Tropocinesis (rotation of the spindle axis), moreover, occurs, although to a minor extent, in material untreated by c-mitotic substances. These effects do not often appear in a regular sequence with increasing concentration of the c-mitotic substance, various deviations from the expected order having been observed.

EXPERIMENTAL TECHNIQUE 578.08

912. PORTER, R. H. 578.08:581.142
633.15:578.08:581.142
- Testing the quality of seeds for farm and garden.**

Res. Bull. Ia Agric. Exp. Sta. 1944 : No. 334 : 495-586.

This bulletin includes a discussion of the various factors that determine seed viability. In the development of hybrid maize it has been found that genetic constitution affects viability, inbred lines and their hybrids showing considerable variation in longevity of seed.

913. MCCARTNEY, J. E.
A new immersion oil ("Polyric").
 J. Path. Bact. 1944 : 56 : 265-66.

The use of a new immersion oil Polyric is recommended which is free from several of the disadvantages of cedar wood oil. It consists of a mixture of dimers and trimers of α -methylstyrene with castor oil. The refractive index is 1.515 at 20° C.

*BOTANY 58

914. LEVINE, M. 581.04:537.531:576.353:575
Colchicine and X-rays in the treatment of plant and animal over-growths.
 Bot. Rev. 1945 : 11 : 145-80.

This survey includes a description of the effect of X-irradiation, colchicine, acenaphthene and other chemicals, upon mitosis in plants. The use of colchicine in the production of valuable economic plants is also described, with reference to papers summarizing the results of this work.

915. YEAGER, A. F. and
 HAUBRICH, W. P. 581.04:576.356.5:578.08
A comparison of the effect of colchicine applications on plants and seeds.
 Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 251-54.

Notes are given on methods of plant and seed treatments with colchicine. The results are summarized of the experimental application of the methods to a wide range of material.

916. WHITE, O. E. 581.143.32
The biology of fasciation and its relation to abnormal growth.
 J. Hered. 1945 : 36 : 11-22.

Fasciation is a widespread abnormal phenomenon in vascular plants. Causes may be either hereditary or environmental. True-breeding races showing the character arise as mutations. Such races have been obtained in tobacco, maize and peas.

917. STOUT, A. B. 581.162.5:576.356.5
Inactivation of incompatibilities in tetraploid progenies of *Petunia axillaris*.
 Torreyia 1945 : 44 : 45-51.

Autotetraploid lines of *P. axillaris* derived from the normal diploid types are infertile when crossed to the parent diploid, but exhibit an inhibition of the incompatibility systems which were operative in the original parents.

918. MCNAIR, J. B. 581.192:576.12
Plant fats in relation to environment and evolution.
 Bot. Rev. 1945 : 11 : 1-59.

The chemical composition of plant fats is dependent both on genetic and environmental factors, temperature being particularly important. The same plant may show considerable variation in the nature of its fats when grown under different conditions, and the extent of this variation is itself a varietal character. Changes in the fats may also accompany the process of maturation. Particular fatty acids may characterize a whole angiosperm family but interspecific and even intervarietal differences in the content of certain fats may be considerable. In general, it is believed that there is a tendency for an increased number of acids in the seed fats, a larger number of carbon atoms per acid, and a higher iodine number of the total fats, to accompany the process of evolutionary development. Parallel results were derived for lower plants. In the light of these generalizations, the author discusses the phylogeny of the angiosperms, the relative evolutionary status of monocotyledons and dicotyledons, the evolutionary relation between trees and herbs, and the relative advantages of the taxonomic systems of Engler and Bessey.

919. JOHANSEN, D. A. 581.3
A critical survey of the present status of plant embryology.
 Bot. Rev. 1945 : 11 : 87-107.

This survey gives a critical account of the embryology of Angiosperms. In the section devoted to the discussion of the relationship between embryology and genetics, it is suggested that in

* General studies, see also individual crops.

interspecific crosses where the zygote fails to develop beyond the two-celled proembryonic stage irreconcilable sets of inherited embryonomic laws are operative; where the parents conform to identical embryonomic laws the zygote shows successful development. In cases of monstrous hybrid embryos it is presumed that each parent conforms to a different variation of the same proembryonic type of cell-division. The need to study the embryonomy of both parents and hybrid offspring is stressed.

920. LEMOS PEREIRA, A. DE 581.331.2:578.65
 Sobre o citoplasma e a membrana da célula vegetal. II. Microsporos e outras células, plastos e outras formações celulares perante a reacção de Feulgen. (The cytoplasm and the membrane of the plant cell. II. Microspores and other cells, plastids and other cellular formations and the Feulgen reaction).
 Bol. Soc. Brot. 1943 : 17 : 167-81.

The pollen grains were studied in a large number of plant species, including a number of economic plants such as *Brassica oleracea* L., *Raphanus Raphanistrum* L., *Medicago marina* L., *Trifolium repens* L., *Vicia sativa* L. and *Salix fragilis*. The membrane of the pollen grain gave a positive reaction in all the species studied. Other features of the pollen grains and other tissues were also observed. Bodies of unknown origin, giving a positive Feulgen reaction, were observed in the cytoplasm of many cells.

921. BABCOCK, E. B. 581.9
 Alice Eastwood Semi-Centennial Publications. No. 11. Endemism in *Crepis*.
 Proc. Calif. Acad. Sci. 1944 : 25 : 269-89.

Among the Old World species of *Crepis* are two very diverse groups, the most primitive perennial species, half of which are alpine relics, and the advanced annual species which mostly occur at low altitudes under arid conditions. The Age and Area concept of Willis is held to break down in the light of the data obtained from these two diverse groups.

*PLANT DISEASES AND PESTS 632

922. LURIA, S. E. 632.3:575.2
 Mutations of bacterial viruses and of their bacterial hosts.
 Genetics 1945 : 30 : 13-14. (Abst.).

A study of the bacterial mutants resistant to normal and mutant viruses revealed the following relationships: (1) resistance to the parent virus may be caused in the same strain by different mutations which may or may not lead to resistance to the mutant virus; (2) bacterial mutations leading to resistance to the mutant virus also lead to resistance to the parent virus; and (3) bacterial mutations leading to resistance to unrelated viruses are generally independent.

923. ZAMENHOF, S. 632.3:575.2
 "Mutations" and cell divisions in bacteria.
 Genetics 1945 : 30 : p. 28. (Abst.).

This study deals with the problem of whether bacteria "mutations" can occur without cell divisions.

924. SMITH, W. E. 632.3:577.8
 Observations indicating a sexual mode of reproduction in a common Bacterium. (*Bacteroides funduliformis*).
 J. Bact. 1944 : 47 : p. 417.

Sexual fusion is reported for the bacterium *B. funduliformis*.

925. DEMEREC, M. and FANO, U. 632.3-1.521.6:575.242
 Bacteriophage-resistant mutants in *Escherichia coli*.
 Genetics 1945 : 30 : 119-36.

Nutritional changes in resistance to several bacteriophage strains have been studied in the strain *Escherichia coli* B. The results indicate that mutations to different resistance types are independent and probably produced by changes comparable with gene mutations.

* General studies, see also individual crops.

926. DEMEREC, M. 632.3:632.421.2-1.521.6:576.16
Production of *Staphylococcus* strains resistant to various concentrations of penicillin.
 Proc. Nat. Acad. Sci. Wash. 1945 : 31 : 16-24.

Strains of *S. aureus* resistant to penicillin have been obtained by exposing cultures of the bacterium to appropriate concentrations of penicillin. It is believed that resistance to penicillin arises by random mutation, the penicillin merely eliminating susceptible strains.

927. LINDEGREN, C. C. 632.421.2:575.125
Heterokaryosis and heterosis in the fungi; their biological and industrial significance.
 Genetics 1945 : 30 : p. 13. (Abst.).

Heterocaryosis, the natural condition of the filamentous ascomycetes, is discussed with reference to the reduction in potency of the penicillin-producing cultures of *Penicillium notatum*. One artificially produced heterocaryon of *P. notatum* was found to have a capacity for penicillin production much below that of either original culture. Another heterocaryon, between an average and a high producer, was found to have the same potency as the high producer. It appears that the low producer was deficient in some substance essential for penicillin production which the high producer supplied in excess to the combination.

928. HOLLAENDER, A. and ZIMMER, E. M. 632.421.2:575.243:535.61-31:537.531
The effect of ultraviolet radiation and X-rays on mutation production in *Penicillium notatum*.
 Genetics 1945 : 30 : p. 8. (Abst.).

Spore suspensions of *P. notatum* were irradiated with monochromatic ultraviolet radiation between 2280 and 2967 Å and medium hard X-rays. The mutation rate increased with increasing ultraviolet energy up to a maximum, and dropped with further irradiation. The most efficient wavelength in the production of stable alterations was 2650 Å. Different strains showed a varied response to ultraviolet radiation. In the X-ray series the mutation rate showed a linear relationship with increasing energy.

929. BAKER, G. E. 632.421.2:577.8
Heterokaryosis in *Penicillium notatum*.
 J. Bact. 1944 : 47 : p. 581.

Heterocaryosis in *P. notatum* may arise either through the anastomosis of several homocaryotic strains or through the germination of a diploid conidium. It is possible that the desirable properties of cultures of *P. notatum* depend upon the maintenance of a certain degree of heterocaryosis.

930. SPIEGELMAN, S., LINDEGREN, C. C. and LINDEGREN, G. 632.422.3:575.182
Maintenance and increase of a genetical character by a substrate-cytoplasmic interaction in the absence of the specific gene.
 Proc. Nat. Acad. Sci. Wash. 1945 : 31 : 95-102.

In the absence of melibiose, a 1 : 1 segregation of ascospores able and unable to ferment this sugar was obtained from certain F_1 hybrids of *Saccharomyces cerevisiae* and *S. carlsbergensis*. In the presence of melibiose, all four ascospores could ferment melibiose and retained this power indefinitely. It is suggested, therefore, that although the power to ferment melibiose may arise through the effect of a gene, it may be perpetuated indefinitely in the cytoplasm.

931. MILLE, L. 632.951.1(86)
Los Barbascos. (The Barbascos).
 Flora, Ecuador 1944 : 2 : Nos. 5-6 : 127-38.

A survey is given of the rotenone-yielding plants of Ecuador, known in that country under the general name of "Barbascos".

J. G. H.

932. MOORE, R. H. 632.951.1:575(73)
Derris grows in America.
 Agric. Amer. 1945 : 5 : No. 1 : 10-12, 16, 18.

The article includes a description of the two varieties of *Derris elliptica*, Sarawak Creeping and Chang No. 3.

ECONOMIC PLANTS 633

933. STELZNER, G. 633-2.8-1.521.6:581.48
 Zur Frage der Virustübertragung durch Samen, insbesondere des X-, Y- und Blattrollvirus der Kartoffel. (**The question of virus transference through seeds, with special reference to the X, Y and leaf-roll viruses of the potato**).
 Züchter 1942 : 14 : 225-34.

The following viruses have been investigated to determine whether they can be transferred through the seed of various hosts, and if so to what extent: *Phaseolus virus* 1, *Soja virus* 1, *Pisum virus* 2, *Trifolium virus* 1, *Lactuca virus* 1, *Cucumis virus* 1, *Delphinium virus* 2, *Nicotiana viruses* 1, 12A, 12B and 13, *Humulus virus* 3, *Abutilon virus* 1 and the X, Y, and leaf-roll viruses of the potato. It was found that virus transference through the seed is a character determined both by the type of the virus and the genotype of the host plant. Varietal difference in the host plant may be sufficiently important to merit the attention of plant breeders.

934. MOORE, R. P.,
 RIGNEY, J. A.,
 MIDDLETON, G. K. and
 BENNETT, L. S. 633.00.14(75.6)
Official variety tests—1943. Corn—soybeans—cotton—wheat—oats—barley.
 Bull. N.C. Agric. Exp. Sta. 1944 : No. 343 : Pp. 50.

This bulletin reports the results of the 1943 tests of maize, wheat, oats, barley, cotton and soya beans, carried out to determine which varieties are best adapted to the various parts of North Carolina.

CEREALS 633.1

935. MAYR, E. 633.1(43)
 Beiträge zur Sortenfrage im Bergbauernbetrieb der Alpengaue. (**Contributions to the variety question in the management of hill farms of the Alpine districts.**)
 Züchter 1942 : 14 : 249-52.

After a short discussion of the climatic factors characterizing regions at high altitudes, the author enumerates the various characteristics necessary in cereal varieties grown under these conditions, viz. resistance to lodging, disease resistance, grain quality, rapid growth and maturation, winter hardiness and a convenient harvesting time. Short accounts are given of well-adapted or promising varieties, including the following: Schlägler, Petkuser, Lungauer and Kefermarkter ryes; Steirische Ennstaler (Styrian Ennstaler), Ritzlhofer, Engelens Siegfried, Stauderers Markus, Kraffts Siegerländer, Buchers Begrannter, Lichtis, Weihestephaner, Akklimatisierte Huron (Acclimatized Huron) and Alpine Binkel wheats; Peragis Mittelfrüh (Peragis Medium Early), Peragis 12, Friedrichswerter, and 6-rowed Montavoner barleys; and Wadsacks Gelb (Wadsack's Yellow), Eckendorfer Borriesa and Endress Weiss (Endress White) oats.

936. 633.1:575.127.5(47)
Russia makes magic wheat, perennial, resists smut and rust.
 Sth. Seedsman 1945 : 8 : No. 3 : p. 32.

This article is a brief account of the perennial hybrids produced by Tsitsin (cf. Cicin, *Plant Breeding Abstracts*, Vol. XV, Abst. 602) in the Soviet Union by crossing wheat with couchgrass. The successful hybridization of rye and *Elymus* and experiments which include the grafting of barley on the giant type of barley Sakhalin are also mentioned.

937.

633.11:575(76.4)

Westar—promising star in Texas winter wheat show.

Sth. Seedsman 1945 : 8 : No. 3 : p. 48.

Westar is new hard red winter variety of wheat, developed from a cross involving Kanred, Hard Federation 25007 and Tenmarq. It is highly resistant to leaf rust but susceptible to black stem rust. It has a high yield, test weight and good milling and baking qualities. It is equal to Comanche and Wichita in winter hardiness.

938.

VOGEL, O. A.,
SWENSON, S. P. and
HOLTON, C. S.

633.11:575(79.7)

Orfed wheat.

Bull. Wash. Agric. Exp. Sta. 1944 : No. 451 : Pp. 10.

Orfed is a new variety of white wheat primarily adapted to conditions in eastern Washington, either as an autumn or spring sown variety. It has been selected from the cross Oro x Federation. It is a medium tall, stiff-strawed variety with resistance to shattering. Its yield, hardiness and resistance to lodging compare favourably with those of the standard varieties. It is smut resistant and highly resistant to most races of bunt. It is more susceptible to dwarf bunt than Hymar and Rex but more resistant than Triplet and Golden.

939.

PAO, W. K. and
LI, H. W.

633.11:575.061.633(51)

Maternal inheritance of variegation in common wheat.

Chinese J. Sci. Agric. 1944 : 1 : 166-71.

The inheritance of a yellow stripe variegation occurring in the variety Mo's 101 has been investigated in a number of crosses. The leaves, stems, spikes and even the anthers of the variegated plants are all yellow-striped. Transmission of the character was found to take place only through the female parent. The progeny of variegated plants always segregate into normal green, variegated and pure yellow plants, green being dominant in the majority of lines. The possible mode of this apparent case of maternal inheritance is discussed.

940.

SVINAREV, V. I.

633.11:575.114"793"

(The segregation of F_2 and F_3 wheat hybrids with respect to the length of the vegetative period).

Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1942 : 3 : 178-80.

A comparison of the F_1 and F_2 generations from a number of wheat crosses showed an entire absence of correlation between the two generations in time of ear emergence. In some crosses F_2 segregates came into ear earlier than either the F_1 or the earlier of the two parents. In the cross Candicans 75/09 x Hordeiforme 0226, 74.5% of the F_2 plants were earlier than the F_1 . It is clear therefore that selection for earliness cannot be carried out on the F_1 .

In crosses between two fairly early spring forms of *T. durum* certain winter forms segregated out in the F_2 and F_3 although the majority of the F_3 plants eared as early as the early parent or before.

941.

MEDVEDEVA, G.

633.11:575.115:575.3

(The problem of dominance in wheat).

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : Nos. 8-9 : 29-36.

Various wheat hybrids were sown at 3 different sowing dates, February, April and June. In the cross *Triticum dicoccum rufum* x *T. persicum fuliginosum* the seed sown at the first and third dates gave rise to plants mainly resembling *T. dicoccum* whereas those sown at the second date, which developed under conditions most nearly resembling those of cultivation, were mainly of the *T. persicum* type. Thus from the second sowing date the hybrids had only partially brittle rachis; in glume length and ear density they resembled *T. persicum*, and in grain size and form they were intermediate, as was also the ease of threshing. In the first and third series on the other hand the hybrids resembled *T. dicoccum* in almost everything but the black colour of the ear and the long glume teeth.

In hybrids of *T. dicoccum rufum* x branched *T. turgidum*, the characters of the *T. dicoccum* parent were dominant in the first sowing and those of the *T. turgidum* parent were more evident in the second sowing.

T. durum melanopus x *T. persicum fuliginosum* hybrids were intermediate between the parents in the second sowing and resembled *T. durum* in the third and *T. persicum* in the first. It is pointed out that *T. persicum* is a mountain wheat accustomed to low temperature, whilst *T. durum melanopus* is from the Transvolga; thus the characters that are manifested in the hybrids are those of the parent whose normal growing conditions are most nearly simulated by the treatment applied.

T. durum melanopus x *T. turgidum compositum* hybrids resembled *T. durum* in the first sowing and developed many more *T. turgidum* characters in the second sowing.

In the cross *T. persicum fuliginosum* x *T. turgidum dinurum* the hybrids resembled the latter parent in both second and third sowings when grown under normal conditions of illumination, but when grown under short day conditions they resembled *T. persicum*. The number of spikelets was intermediate in normal day and equal to *T. persicum* in short day conditions.

T. turgidum is the most exacting of the species used and its characters were dominant only in the second sowing periods. In general, the dominance or recessiveness of a character is regarded as a purely relative concept, depending both on the parental combination of the species and on the environmental conditions under which the hybrids are raised.

942. SVINAREV, V. I. 633.11:575.115"793":581.143.26.035.1
(An investigation of the length of the vegetation period in wheat. On the dominance in F₁).

Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1942 : 3 : 173-77.

During the period 1938-40 92 combinations of *T. durum* x *T. durum*, *T. durum* x *T. vulgare* and *T. vulgare* x *T. vulgare* were examined. In some combinations the F₁ came into ear before the earlier of the two parents, in others it eared later than the later parent, while in the rest it was intermediate or coincided with one of the parents; 67.4% of the hybrids belonged to the intermediate group.

Continuous light caused an acceleration of ear emergence in both parents and hybrids and curtailment of the day length had the reverse effect. The relative positions of parents and hybrids was sometimes altered by light treatment; thus *Erythrospermum* 1841 x *Lutescens* 062 eared with the early parent in normal day length, but was 1 day later in continuous light and was later than both parents in the short day treatment. Again, *Lutescens* 062 x *Hordeiforme* 0226 was 1 day earlier than the early parent in normal day length but 16 days later under short day.

943. KUPZOW, A. J. 633.11:575.12:575.148(57)
An attempt of synthesizing winter wheats for the sub-tayga zone of west Siberia.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1944 : 43 : 166-69.

There are still no varieties of winter wheats that would satisfy the economic requirements of the "sub-forest" zone of west Siberia and other parts of Siberia. The humid summer in the "sub-forest" zone is not favourable to the xeromorphic steppe wheats, and in spite of not being so winter hardy the more hydrophilous types of winter wheats of the wood-steppe and woody zone of the European region often prove more productive than the steppe varieties. The crossing of steppe winter wheats with winter wheats of zones with excessive moisture appears to be highly promising in this problem.

In summer 1940, the Saratov variety 0329 was crossed and back-crossed with Dutch winter wheat, with the Moscow variety 24-11, Uzbek winter wheat, the Pamir summer variety Ezhovka and with Garnet. The hybrids produced by direct crosses and back-crosses were identical in morphological characters. Neither did they show any distinction in the growing period, the summer habit being invariably a dominant character. Out of the parental forms only variety Saratov 0329 and Moscow 24-11 showed survival to wintering in spring 1942. Among the F₂ hybrids the plants that survived wintering best were those crosses in which the variety Saratov 0329 participated as the mother plant; the F₂ hybrids that survived gave a satisfactory yield, both qualitatively and quantitatively. The best individual progenies were those derived from crosses between Saratov 0329 and the Dutch winter wheat and the central Russian varieties. They show a winter hardiness similar to that of the steppe variety 0329, a superior tillering habit, and a yield per unit area 1.5-4 times that of Saratov 0329. There are ample grounds for expecting that, if improved by breeding, these progenies will give valuable varieties of winter wheats with a yield higher than that of the best summer varieties.

944. HARRINGTON, J. B. 633.11:575.125:575.12:575.148(73)

Intra-varietal crossing in wheat.

J. Amer. Soc. Agron. 1944 : 36 : 990-91. (Abst.).

A study was made of heterosis as expressed by yield in three intravarietal crosses. The results showed significant heterosis in the F_1 from Reliance x Reliance and in the F_1 from Apex x Apex, but none in Marquis x Marquis. The cross Reliance x Reliance showed a significantly higher yield than the parental variety for four generations. In the cross Apex x Apex hybrid vigour appeared to decline after the F_3 . The selection which each of the parent stocks has undergone is discussed. The results raise important questions for the plant breeder, and the study is being continued.

945. CHIN, T. C. 633.11:575.127.2:581.46:575.11(51)

The inheritance of some quantitative characters in the interspecific crosses of wheat.

Chinese J. Sci. Agric. 1944 : 1 : 204-17.

Inheritance of the characters beardedness, colour of glume, density of ear, pubescence and length of glume have been studied in the crosses American Club (*T. compactum*) x White Spelt (*T. Spelta*) and Polish (*T. polonicum*) x Emmer (*T. dicoccum*). A review is given of papers which include investigations of the inheritance of these characters.

Red colour of the glume shows simple dominance to white. Beardlessness in the F_2 and F_3 progenies of the cross American Club x White Spelt is incompletely dominant over the bearded condition. Results from the cross Polish x Emmer indicate that pubescence is a simple dominant over white.

The genotypes of ear types in the F_2 generation of the cross American Club x White Spelt are described as follows: *compactum*, $C_1C_1C_2C_2ss$; laxer *compactum*, $C_1C_1c_2c_2ss$; compacto-spelt, $C_1C_1C_2C_2SS$; compacto-spelt laxer $C_1C_1c_2c_2SS$; spelt, $c_1c_1c_2c_2SS$; spelt (denser), $c_1c_1C_2C_2SS$; dense *vulgare*, $c_1c_1C_2C_2ss$; and *vulgare*, $c_1c_1c_2c_2ss$. The *compactum* type of ear is controlled by two homozygous pairs of dominant genes C_1C_1 and C_2C_2 , the double recessive being the *vulgare* type. The *Spelta* type is due to the presence of the dominant genes SS for toughness of glumes. The pairs of genes, C_1C_1 and C_2C_2 , and SS have a pleiotropic effect on toughness of glume and density of ear.

Two pairs of genes control length of glume in the *polonicum* type of ear, P_1P_1 and P_2P_2 . The double recessives give rise to the Emmer type.

With the exception of S and the gene B for beardlessness in the cross American Club x White Spelt, all the genes studied are independently inherited. S and B show a linkage relationship of 37.26%.

946. WALDRON, L. R. 633.11:575.127.5:633.289:575(78.4)

Perennial wheats.

Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1944 : 7 : No. 2 : 26-27.

This brief article discusses the recent development of perennial wheats in the Soviet Union, and points out the possibility of obtaining from the cross wheat x *Agropyron* a variety of winter wheat hardier than any present variety.

947. PISSAREV, W. E. and
VINOGRADOVA, N. M. 633.11:575.127.5:633.289:575.257

Hybrids between wheat and *Elymus*.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1944 : 45 : 129-32.

A method of grafting the embryo of one component of an intergeneric cross on the endosperm of the other has been applied in hybridization experiments with wheat, barley, rye and *Elymus*. Wheat plants of the variety Lutescens 62 produced by growth on the endosperm of spring rye were morphologically similar to the controls. The grain, however, differed from that of the controls by its dull coloration and less vitreous appearance. The chemical content of the grain of the grafted wheat approached that of the spring rye. An increased percentage of grain was obtained from crosses between grafted Lutescens 62 and the rye; growth hormones in the rye endosperm are believed to be the chief factor responsible for the increase. In hybridization experiments involving wheat and *Elymus* the best results were obtained in those cases where both male and female plants of one component had been grafted on the endosperm of the other. The hybrid seed gave a very low percentage of germination, on account of the abnormal development of the embryos. Vigorous plants, described as hybrids, have however been obtained. These possess leaves resembling those of *Elymus* and spikes of a mixed type.

948. SKOSYREVA, A. N. 633.11:575.127.5:633.289-1.813-1.521.6
(Question of the salt resistance of perennial wheat).
 Vestnik Akademii Nauk S.S.S.R. (Record of the Academy of Sciences
 U.S.S.R.) 1944 : No. 6 : 80-87.

Seeds of Cicin's perennial wheat No. 34085 were sown in pots in sand and watered with Hellriegel's solution to which varying quantities of NaCl and Na₂SO₄ had been added. The variety Caesium 0111 was used as control. The perennial wheat seedlings developed more vigorously and produced better plants in solutions containing 0.04% NaCl than in those without NaCl. Thus in the normal solutions without salt the yield of grain was 16.43 grm. and in those with 0.04% NaCl it was 18.46; with 0.25% NaCl the yield was still almost normal and the yield of grain in 0.35% NaCl solutions was only reduced to 11.03; even in 1% solutions some grain was formed. The control plants of Caesium 0111 failed to grow at all in 1% NaCl solutions and produced no grain even in 0.35% and 0.25% solutions.

In isotonic solutions of NaCl and Na₂SO₄ the perennial wheats gave higher yields with Na₂SO₄. Thus with 0.35% NaCl the yield per pot (three plants) was 11.03 grm. and with 0.5% Na₂SO₄ it was 14.76 grm.; with 1% NaCl the yield was 3.63 grm. and with 1.5% Na₂SO₄ it was still 10.76 grm. In the early growth phases however the perennial wheat was less tolerant of the sulphates than the chlorides.

The straw was found to contain larger quantities of salts than the grain and in fact exuded much of it on to the surface. The plants grown in high salt concentrations bore quite large grains, which had a higher protein content than those grown without salt.

949. McFADDEN, E. S. and SEARS, E. R. 633.11:575.129:581.162.5:575(73)
The artificial synthesis of *Triticum spelta*.
 Genetics 1945 : 30 : p. 14. (Abst.).

An amphidiploid has been produced by colchicine treatment from the cross wild tetraploid wheat *Triticum dicoccoides* ($n = 14$) x *Aegilops squarrosa* ($n = 7$). This amphidiploid is cytologically stable, highly fertile, and morphologically almost identical with a variety of *T. Spelta* ($n = 21$). F₁ hybrids of the amphidiploid with *T. Spelta* (and *T. vulgare*) are fairly regular in cytological behaviour. Their fertility under favourable conditions is almost complete. The F₂ hybrids of the cross amphidiploid x *T. Spelta* are uniformly fertile and show segregation for minor characters only. *Ae. squarrosa* thus appears to be the source of the third set of 7 chromosomes (the so-called C genome) of *T. Spelta* and *T. vulgare*. Further evidence of this has been obtained by synthesizing *Ae. cylindrica* ($n = 14$). An amphidiploid produced from the cross *Ae. caudata* ($n = 7$) x *Ae. squarrosa* has proved very similar in morphology and chromosome constitution to *A. cylindrica*, which was previously known to possess both the C genome and the genome of *Ae. caudata*. Identification of *Ae. squarrosa* as the possessor of the C genome should facilitate the transfer of characters from the tetraploid wheats to the hexaploid (*T. vulgare*), by providing a means of avoiding the sterility normally encountered in hexaploid x tetraploid hybrids.

950. BERTSCH, F. 633.11:576.16
 Der Dinkel. (*Spelt*).
 Landw. Jb. 1942 : 92 : 241-52.

An account is given of the history, natural variation and importance of spelt. It is believed that the cereal arose in the Swabian sub-alpine zone in the Bronze Age from a cross between *Triticum dicoccum* and *T. compactum*. It was carried to England by the celts in pre-Roman times, and in later ages was introduced into Asturias and Transylvania.

951. GÖKGÖL, M. 633.11:576.16
 Über die Genzentrentheorie und den Ursprung der Weizen. (**The gene
 centre theory and the origin of wheat**).
 Z. Pflanzenz. 1941 : 23 : 562-78.

Tetraploid wheats are represented by a rich diversity of forms in Asia Minor which is regarded as the centre of origin, in opposition to Vavilov's suggestion that these forms arose in Abyssinia. In the case of *Triticum vulgare*, 223 out of a total of 270 varieties are known in Asia Minor, in contrast to the 78 in Afghanistan and Persia. The missing varieties are members of the

cligulatum and *inflatum* groups, and it is pointed out, with reference to the latter, that, since hooded wheats are found in Afghanistan and Abyssinia but not in the intervening regions, it is probably a secondary formation. *T. compactum* is represented in Asia Minor by 100 out of a total of 137 varieties, and here again it is suggested that Asia Minor is the centre of origin.

A large number of the endemic Turkish varieties have only recently been described by the author, and a synopsis of these is presented at the conclusion of the paper.

952. LI, H. W.,
PAO, W. K. and
LI, C. H. 633.11:576.356:581.02:575.11
Desynapsis in the common wheat.
Amer. J. Bot. 1945 : 32 : 92-101.

A genetically determined meiotic aberration in wheat is described. Synapsis occurs during meiotic prophase but the synapsing chromosomes tend to fall apart before metaphase, a mode of behaviour termed desynapsis in contrast to asynapsis which is understood to apply only to meioses where synapsis never occurs. Desynapsis is determined by a recessive gene *ds*. Its mode of expression is affected markedly by environmental conditions, especially temperature, and possibly also by modifying genes.

953. LI, C. H. and
LI, H. W. 633.11:576.356.52:576.354.4(51)
Cytological studies of a haploid wheat plant.
Chinese J. Sci. Agric. 1944 : 1 : 183-89.

A haploid plant was obtained in the F_3 progeny of a cross between two varieties of *T. vulgare*, Quality and a selected strain of Chinese wheat 18-3874. Segregation for asynapsis occurred in this cross, but all small and weak plants occurring in the progenies were found to have the normal chromosome number with this one exception. A description is given of the haploid plant and its microsporangogenesis.

954. ŠMUK, A.,
PISAREV, V. and
VINOGRADOVA, N. 633.11:581.165.71:581.483:633.14
(Changes in the characteristics of wheat germinated on rye endosperm).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : No. 7 : 9-11.

Soft wheats and *Triticum durum*, *T. monococcum*, naked barley, oats and spring rye were used in these experiments.

The transplantation procedure is described. The grafted plants and the control were raised in the greenhouse. The results of grafting embryos of the spring wheat *Lutescens* 062 on to the endosperm of spring rye from Eastern Siberia are described in detail as follows:—

The grafted plants differed from the controls in having a less vitreous seed of a dull grey colour and somewhat angular in shape with a markedly convex furrow and shorter than usual; some barrel-shaped seeds occurred.

Biochemical analysis showed a pronounced increase in the nitrogen and protein content and some reduction in the amount of starch. Moreover, gluten made from the flour of the grafted plant was dark brown like rye dough, in contrast to the ordinary light pink colour of the gluten from the control. This contrast is attributed to a difference in the content of tyrosine and in the activity of the tyrosinase. Dough from the grafted wheat also acquires a dark brown colour approaching that of rye bread.

Other tests showed that the seeds of the grafted wheat contained an appreciable amount of carbohydrate typical of rye and not found in wheat.

The main cause of these changes in the grafted plants is attributed to the phytohormone action of the rye endosperm.

These results were used to increase the set of seed in wheat x rye crosses. Embryos from the seed of the grafted *Lutescens* 062 and Hybrid 170 were transplanted on to the endosperm of spring rye and the resulting plants crossed with the same variety of spring rye. *Lutescens* 062 gave a set of 4.3% while grafted plants gave 25%, and the corresponding figures for Hybrid 170 were 3.4% and 11.5% respectively.

955. ELGUETA G., M. 633.11:581.192(83)
Influencias que determinan la composición mineral del trigo. (**Influences which determine the mineral composition of wheat**).
Agric. Tec. Chile 1944 : 4 : No. 1 : 7-16.

Analyses were made of 21 wheat varieties in regard to their phosphorus, calcium and potassium contents. The differences due to variety were much less pronounced than those due to locality and manuring.

956. ALEXANDROV, V. G. and ALEXANDROVA, O. G. 633.11:581.3
(**The question as to whether the polar nuclei of the embryo sacs have their own protoplasm**).
Sovetskaja Botanika (Soviet Botany) 1944 : No. 1 : 19-33.

The authors point out the remarkable lack of attention that has been given, even by very competent observers, to the behaviour of the cytoplasm in studies of fertilization and allied phenomena. The same applies to the polar nuclei. Observations on the embryo sacs of the wheat *Lutescens* 062 were made on plants where fertilization had failed to be effected on account of the adverse conditions of the Northern Caucasus where they were grown. As time passed the polar nuclei became very much elongated, whereas the antipodal cells and embryo sacs preserved their original shape. This difference is ascribed to the presence of cytoplasm round the polar nuclei; figures are given in which this cytoplasm is actually visible. The same phenomenon was observed in wheats grown at Hibiny within the arctic circle. When the wheats were grown at Pushkin, near Leningrad, normal fertilization took place and the cytoplasm surrounding the polar nuclei was not so clearly visible.

957. BERG, S. O. 633.11:581.6:519.241.1
Über die Beziehungen zwischen Körnerertrag, Rohproteingehalt und Rohprotein-ertrag verschiedener Weizensorten sowie ihre züchterische Bedeutung. (**The relations between grain yield, crude protein content and crude protein yield of different wheat varieties and their significance for breeding**).
Z. Pflanzenz. 1941 : 23 : 542-61.

Statistical data are assembled to show that the grain yield of wheat varieties is correlated negatively with the crude protein content and positively with the yield of protein per hectare. The significance of these findings to wheat breeders wishing to combine high yield with high protein content is indicated.

958. NOVER-SCHLICHTING, I. 633.11-2.421.1:576.16:631.521.6:575.11
Untersuchungen über den Weizenmehltau, *Erysiphe graminis tritici*, im Rahmen der Resistenzzüchtung. (**Researches on the wheat mildew, *E.g. tritici*, with reference to breeding for resistance**).
Z. Pflanzenz. 1941 : 24 : 71-103.

Extensive investigations into the resistance exhibited by wheat varieties to mildew infection have demonstrated both the importance of varietal differences in susceptibility and the fact of physiological specialization on the part of the pathogen. Winter wheats tend to be more susceptible than spring varieties. The material collected by the German Hindu Kush Expedition was included in the material examined, and resistant lines have been selected.

Mildew collections from many localities were inoculated into the following differential hosts: Persian Black, Greek 3, Normandie, Illinois 1 Sel. 47, Dixon C.I. 6295, Vernal C.I. 1524, Vernal C.I. 3886, Norka C.I. 4377, Fram, Hope, Axminster C.I. 1839, Anatolian 85, Anatolian 1210, Anatolian 50, Ruskea von Hankkya, Sonora C.I. 4293, Anatolian 842, Chul C.I. 2227 and Krafft's Dickkopf winter wheat. Differential response was thereby demonstrated although it is emphasized that many of the fungus samples may have contained mixtures of physiological races. The differences observed between greenhouse and field susceptibility to mildew are discussed and experiments are described to show that resistance may change as the plants mature. In several cases, the adult plants are more resistant than the juvenile, and in some instances, varietal differences in susceptibility, not evident in the young plants, appear in the adults.

Segregation for mildew resistance was obtained in the cross (Chinese 166 x Carsten V) x Persian Black; although in view of the chromosome differences between the parents, no attempt was

made to account for the segregation ratios along simple Mendelian lines. When Illinois No. 1 Sel. 47 was crossed with various susceptible winter varieties and inoculated with mildew race 3 of provenance H50₃₇, resistance proved to be dominant, the following segregation ratios being obtained: 4.05:1, 5.16:1, and 6.57:1. In this case, therefore, resistance does not appear to be determined monomerically. Similarly, 1020₃₁ x Normandie gave a similar segregation of 6.38:1. In the case of crosses between Dixon C.I. 6295 and susceptible winter wheats, however, a 3:1 ratio of resistant to susceptible F₂ individuals was obtained, the progenies being inoculated with a Swedish mildew sample termed "Fuchs."

959. WELLS, D. G. and 633.11-2.421.1-1.521.6:575.11(73)
SWENSON, S. P. 633.11-2.452-1.521.6:575.11(73)
**Inheritance and interaction of genes governing reaction to stem rust,
leaf rust, and powdery mildew in a spring wheat cross.**
J. Amer. Soc. Agron. 1944 : 36 : 991-92. (Abst.)

The F₂, F₃ and F₄ generations of crosses between a hard red wheat selection from H44-Reward x Baringa and a soft white spring wheat selection from Hard Federation x Dicklow were studied for reaction to stem and leaf rust and powdery mildew. Two or three gene pairs evidently control reaction to stem rust, single gene pairs, *Lm lm* and *Ms ms*, reaction to rust and powdery mildew. A cross-over value of $20.8 \pm 2.0\%$ was found for the genes controlling reaction to leaf rust and mildew.

960. 633.11-2.451-1.521.6:575(79.2)
New smut resistant wheat released by station.
Fm Home Sci. Utah 1944 : 5 : No. 3 : p. 5.

Wasatch, formerly designated as 122 A and C.I. 11925, is a new variety of hard red winter wheat. It has been obtained from a cross between Redit and Relief, and is more resistant to smut than any commercial variety, and has a stiffer straw. Its yielding quality in the absence of smut is no higher than that of Utah Kanred and Relief. In years of smut attack, however, this variety should out-yield the susceptible varieties.

961. BAKER, G. A. and 633.11-2.451.3-1.521.6:519.24
BRIGGS, F. N.
Wheat bunt field trials.
J. Amer. Soc. Agron. 1945 : 37 : 127-33.

A design has been developed for field trials in which infection of wheat by bunt is under investigation. It should be of value in the interpretation of the results in the case of complex hybrids, since the nature of the variances is satisfactorily analysed. It should be of particular value where a row or family is heterozygous or consists of plants of different genotypes.

962. FANG, C. T. 633.11-2.452:576.16:631.521.6(51)
**Physiologic specialization of *Puccinia glumarum* Erikss. and Henn.
in China.**
Phytopathology 1944 : 34 : 1020-24.

Race distinction of *Puccinia glumarum* into 9 physiological forms was based on differences in type of infection observed in 7 varieties of wheat and 1 variety of barley. The races were identified in collections that were mostly from the Yunnan Province, China, and have been designated as races C1 to C9. Of nearly 1500 varieties tested for reaction to C1 and C3, 30 were either immune or highly resistant.

963. SIBILIA, C. 633.11-2.452-1.521.6(45)
Sulla resistenza alle ruggini di alcuni grani di montagna. (On the resistance
of some highland wheats to the rusts).
Ital. Agric. 1942 : 21 : 638-41.

Having recorded differences in the incidence of *Puccinia glumarum*, *P. triticea* and *P. graminis* in northern and central Italy and in mountainous regions, a report (the second) is made on the results of the four year study on rust resistance in highland wheats begun in 1938-39 and conducted mainly at the Experimental Centre of Filippiomboli. On this occasion only 22 strains, 16 of Est (Mottin) and six of Andriolo, were examined, four particularly susceptible strains from Mottin having been excluded.

The 22 strains were so resistant to yellow rust that possible damage by it need not be considered. Several strains were severely attacked by brown rust which is, however, of limited importance, provided resistance to yellow and black rust is adequate.

Though the classification in 1939-40 of the strains on the basis of their resistance to black rust had to be slightly modified owing to the existence of different physiological races of the fungus in a particular locality, the wheats evidently possessed good genetic resistance factors. Four classes were distinguishable: (1) highly susceptible; (2) moderately susceptible; (3) moderately resistant (Est 39a, 110/3, 108/9 and Andriolo 10/12 and 34/6); (4) highly resistant (Est Vd 4, Cr 1139, 72/35, 72/17, 72/23, 94/5, 94/4, 99/9, 39/17, 108/2, 18/2, 18a and Andriolo 12/5, 49/3 and 36/14). Strains 39/17 and 18a still show some variation and are under further observation, but the remaining ten promise to do well even in years of severe infection.

The reactions of certain Est strains and one Andriolo strain support the view that anthocyanin pigmentation is an important factor in resistance to black rust, though not the only one, since Andriolo 34/6 and others completely deficient in this respect showed resistance to the rusts. The other factors in resistance are being investigated.

The site of the pustules also proved to be of importance in determining the degree of resistance (Cf. *Plant Breeding Abstracts*, Vol. II, Abst. 59), location at the superior internode being the most critical in view of the function of this organ in the development of the ear and the caryopses.

Yields on the whole bore out the observations on infection during vegetation, except in two strains in which some unknown vegetative disturbance is suspected to account for the relatively low yields.

The above-mentioned ten strains can be used in the mountains and hilly parts of Tuscany as they will resist the common races of black rust as well as any more virulent races that may arise or appear from other districts.

964. HARRAR, J. G.,
 LOEGERING, W. Q. and
 STAKMAN, E. C. 633.11-2.452-1.521.6(72)
Relation of physiologic races of *Puccinia graminis tritici* to wheat improvement in Southern Mexico.
Phytopathology 1944 : 34 : p. 1002. (Abst.).

In surveys made in Mexico during a period of 12 years the physiological races of *P.g. Tritici* found to be of practical importance were only the races 38, 59 and 19. Many wheat varieties and hybrid lines have recently been tested under epidemic conditions near Mexico City. Marquis and certain other varieties were highly resistant to stem rust. Rival, Newthatch, Regent, Renown, Pilot, Mida and a number of other varieties recently produced in North America were almost free from stem rust and highly resistant to leaf rust, but all these varieties matured later than certain early but highly susceptible commercial varieties commonly grown in Mexico. Appropriate crosses are being made to combine earliness and rust resistance.

965. 633.11-2.452-1.521.6:575(83)
 CORTÁZAR SAGARMINAGA, R. 633.11:575.11
 Estudio de la herencia de la resistencia al *Puccinia graminis tritici* y otros caracteres en los cruzamientos de las variedades de trigo Sinvalochó x Premier y Sinvalochó x Regent. (**Study of the inheritance of resistance to *P.g. tritici* and other characters in crosses of the wheat varieties Sinvalochó x Premier and Sinvalochó x Regent**).
Agric. Tec. Chile 1944 : 4 : No. 1 : 88-97.

The varieties Premier and Regent were chosen as having mature plant resistance, Sinvalochó being completely susceptible. The F_2 of the cross Regent x Sinvalochó contained 174 resistant plants and 221 susceptible. The operation of three factor pairs was assumed and each separate F_2 family conformed to this interpretation.

The Premier x Sinvalochó F_2 contained 271 resistant and 312 susceptible plants; out of 14 families all but two conformed to the three factor interpretation.

There was a slight association between resistance and number of tillers, with a correlation coefficient of 0.498 ± 0.044 . Date of ear emergence and awn production were inherited independently of resistance. Some segregates eared earlier than either parent. Awning proved a simple recessive to awnlessness.

966. CARTWRIGHT, W. B. and SHANDS, R. G. 633.11-2.452:632.7-1.521.6(73)
Wheat varieties resistant to the hessian fly and their reactions to stem and leaf rusts.
 Tech. Bull. U.S. Dep. Agric. 1944 : No. 877 : Pp. 6.

In the period 1939 to 1943 inclusive, domestic and foreign varieties and strains of wheat were tested in the greenhouse and field for resistance to Hessian fly and to stem and leaf rust. Five varieties from Portugal, Uruguay and Argentina showed only traces of leaf rust, 15 varieties showed 5 to 20 per cent. infection. Marquillo and Portugal 90 appeared to be the most resistant varieties to stem rust. The few representatives of club wheat included were susceptible to both rusts. All the *durum* wheats were highly resistant to leaf rust; 6 showed only traces of stem rust, while several selections had low percentages of infection. Some of the *durum* wheats appeared to offer good resistance to the Hessian fly and to both leaf and stem rust.

967. HARRIS, R. H. 633.11:664.641.016(78.4)
Baking quality of flours of five hard red spring wheats.
 Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1944 : 7 : No. 2 : 15-18.

Some differences in protein quality evidently exist among the varieties Thatcher, Rival, Pilot, Vesta and Mida, but not to as great a degree as might have been expected.

968. HARRIS, R. H., SIBBITT, L. D. and SCOTT, G. M. 633.11:664.641.016(78.4)
Comparative effects of variety and environment on some properties of North Dakota hard red spring wheat flours.
 Cereal Chem. 1945 : 22 : 75-81.

In the significant variations obtained in flour yield, ash, protein content and loaf volume, environment was a more important factor than variety. Significant differences in protein quality were obtained in the two micro-baking methods used, due to the effect of both variety and environment. Mixograms secured at a uniform protein level showed significant variation between varieties and stations for dough development stage, range of dough stability, curve height and width.

969. VOGEL, O. A. and BARBEE, O. E. 633.11.00.14(79.7)
Comparative performance of wheat varieties in eastern Washington.
 Bull. Wash. Agric. Exp. Sta. 1944 : No. 450 : Pp. 28.

This bulletin summarizes the results of varietal tests conducted during the thirteen-year period 1931-1943 at three localities in eastern Washington. Comparisons have been based on yield, test weight, resistance to lodging and shattering, plant height, time of maturity and winter hardiness. Descriptions are given of the varieties of White Winter Club wheat, hard red winter wheat and other types.

970. ÅKERMAN, Å., LINDBERG, J. E. and JAKOBSSON, J. 633.11.00.14:664.641.016 (48.5)
 633.14.00.14:664.641.016(48.5)
Undersökningar av kvaliteten hos 1943 års brödsädeskörd. (Investigations of the quality of the 1943 bread cereal harvest).
 Sverig. Utsädesfören. Tidskr. 1944 : 54 : 185-220.

This is a detailed account of official tests of the Swedish wheat and rye harvest in 1943 under the following heads:—collection of samples; distribution of samples according to region and varieties; methods of analysis; baking and milling qualities; and a survey of results, showing purity, water content, hectolitre weight, malting quality and, for wheat, also the crude protein content. In conclusion brief crop reports received from recorders in various districts are appended.

971. SAHAROV, V. V.,
FROLOVA, S. L. and
MANSUROVA, V. V. 633.12:576.356.5(47)
**Production of highly fertile tetraploid buckwheat (*Fagopyrum
esculentum*).**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1944 : 44 : 254-56.

Highly fertile, large grained autotetraploid forms of buckwheat have been obtained. The great number of tetraploids induced by colchicine treatment in the variety Bolshevik provided highly suitable material for selection work. The tetraploid plants reach maturity 7 to 10 days later than the diploid plants, but this lateness is unimportant in buckwheat. A valuable economic character of the tetraploids is that they do not shed their seeds easily. Over-wintered tetraploid seeds are completely viable, for the germinating shoots are more vigorous and are able to break the crust formed after rains more readily. The tetraploids are evidently capable of self-pollination, in contrast to the diploid forms in which self-pollination is rare or absent.

972. SAHAROV, V. V.,
FROLOVA, S. L. and
MANSUROVA, V. V. 633.12:576.356.5:575(47)
Tetraploidy in cultivated buckwheat (*Fagopyrum esculentum*).
C.R. (Doklady) Acad. Sci. U.R.S.S. 1944 : 43 : 213-16.

In an attempt to solve the problem of variability in buckwheat as an economic crop, autopolyploid forms in nine indigenous varieties have been obtained. The polyploid seedlings may be easily recognized by their thicker hypocotyl, and larger, thicker cotyledons. The adult plants develop a more vigorous growth than the diploids, the stems being thick and the branches vigorous, the leaves larger, coarser and deeper coloured. The polyploid plants begin to flower about the same time as the diploids, but their flowers were usually much larger. The tetraploid pollen was so much above the diploid in size that an examination of a few grains from either of the heterostyly types of flowers was sufficient for recognition of the chromosome constitution of the plant.

Polyploidy was also found to lead to marked increase in the volume and weight of seed. This was especially pronounced in the eastern indigenous varieties of Burjat-Mongol and Altai buckwheat, which ordinarily give small seeds inconvenient for husking. The increase in the total weight of polyploid seeds is but partly dependent on the relatively greater mass of husk; the mean weight of husked seeds exceeds that of husked diploid seeds by one third. No correlation between percentage of husk and increase in the weight of seed could be found, nor could any be found between the number of seeds per plant and the mean weight of a single seed. Percentage weight of the husk, length of growing period, fertility, and other characters in the polyploids were very variable. Reduced fertility, however, was not observed in the material. Along with plants that yielded an insignificant amount of seed, there were others that yielded a hundred or more seeds.

The extreme variability of the polyploid forms together with their economically valuable characters opens up the prospect of breeding highly productive and resistant forms even without interspecific or intervarietal hybridization.

973. KROTOV, A. 633.12:581.162.32
(Cross pollination of buckwheat varieties).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : Nos 5-6 : 13-15.

Samples of seed from crops sown on large isolated areas were compared with samples which were the product of one to four years of cross-pollination among different varieties of buckwheat. Cross-pollination made for an increase in the yield of grain, which was most pronounced among varieties whose yield is low, and least pronounced (sometimes a decrease) among those whose yield is high; and the increase became larger as the successive pollinations became more frequent. But a decisive influence was exerted by the conditions which prevailed during the growth of the parent plants and during the period of pollination.

The length of the growth period, certain morphological characters, and the quality of grain were also influenced by the practice of cross-pollination.

I. Z.

974. ÅKERMAN, Å. 633.13:575.12:576.356.5
 Havreskördarna böra ökas. (The oat harvests must be increased).
 Lantmannen 1944 : 28 : 1096-97.

To increase oat production in Sweden special attention must be paid to the choice of suitable varieties for the various districts. The lecturer is inclined to think that in oats the chromosome number is already so high ($2n = 42$) that no advantage is to be obtained by increasing it, and until further light has been thrown on the subject, cross-breeding between different varieties should be relied upon for progress in oat improvement.

975. NIEDERHAUSER, J. S. 633.13-2-1.521.6(74.8)
 Oat disease survey in northern Pennsylvania.
 Plant Dis. Reporter 1944 : 28 : 1072-77. (Mimeographed).

A survey was made in 1944 of the severity of loose and covered smuts, crown rust and *Helminthosporium* leaf blotch upon 10 varieties of oats in Northern Pennsylvania.

976. KINGSOLVER, C. H. 633.13-2-1.521.6(77.7)
 Pathogenicity on *Avena* and growth response of *Pseudomonas coronafaciens* (Elliott) Stapp.
 Iowa St. Coll. J. Sci. 1944 : 19 : 29-31.

Isolates were tested for pathogenicity by spraying suspensions of bacteria in water on uninjured leaves of seedling *Avena* plants, by hypodermic injection of the suspension into the culms of juvenile plants, and by seed infection. Oat varieties inoculated by seed infection showed striking increases in pre-emergence killing and in severity of the halo blight on surviving seedlings. Varietal response shown in this method agreed more closely with field observations than the response of plants sprayed with a bacterial suspension or inoculated by hypodermic syringe. Studies of the field reaction of varieties and selections showed consistent differences in susceptibility to *P. coronafaciens*. Boone, Marion, Hancock, Erban, Anthony, Mutica Ukraina, Gopher and Landhafer, and selections from crosses with these varieties as parents, were in general susceptible to halo blight. Victoria x Richland selections were mostly intermediate in susceptibility. Selections involving Bond as one parent were comparatively resistant. D 69 x Bond selections were outstanding for resistance.

977. PATEL, N. M. 633.13-2.451.2-1.521.6(73)
 Inheritance of loose smut reaction in crosses with Victoria and Smut Resistant (Cornell)-6 under field conditions of growth and infection.
 Abstr. Thes. Cornell Univ. 1942 (1943) : 378-79.

In eight of nine crosses of oats resistance to loose smut was observed to be dominant over susceptibility, a mono-Mendelian ratio being obtained in the F_2 . In the remaining cross a duplicate factor ratio was obtained in the F_2 . Victoria and Cornell 6 were highly resistant to loose smut. Upright was moderately susceptible; Canadian, Ithacan, Victor, Lenroc, Series 1060 Lot-44 and strain No. 428a3-49 were found to be very susceptible. Black lemma behaved as a dominant character over reddish coloration in the cross black glumed Victor x reddish glumed Victoria, a single factor being involved.

978. STOA, T. E. 633.13-2.452-1.521.6(78.4)
 Oats varieties and rust.
 Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1945 : 7 : No. 3 : 8-10.

The yields in North Dakota of the newer rust resistant varieties and the standard varieties are compared. More recent varieties such as Vicland, Boone, Tama and Marion show good rust resistance, but are not immune to all races.

979. COCHRAN, G. W.,
 JOHNSTON, C. O.,
 HEYNE, E. G. and 633.13-2.452-1.521.6:575.11(73)
 HANSING, E. D. 633.13-2.451.2-1.521.6:575.11(73)
 Inheritance of reaction to smut, stem rust, and crown rust in four oat crosses.
 J. Agric. Res. 1945 : 70 : 43-61.

The inheritance of reaction to a mixture of physiological races of *Ustilago Avenae* and *U. levis*, to races 2 and 8 of *Puccinia graminis Avenae*, and race 1 of *P. coronata Avenae*, was studied in

four crosses, (Richland x Fulghum) x (Fulghum x Victoria) and the reciprocal, Fultex x (Richland x Fulghum), and (Anthony x Bond) x (Richland x Fulghum). Reaction to disease was similar in the first three crosses. That of the fourth cross was different because of the genetic constitution of the Anthony-Bond parent.

Study of the reaction of the F_2 and F_3 hybrids in the first three crosses indicated that each parent carried a dominant factor for smut resistance. When these two independently inherited duplicate factors were both absent, the hybrid plant was susceptible to smut. In the last cross a similar condition existed except that there was one dominant factor for high resistance to smut and one for moderate resistance.

Resistance to stem rust was dominant in all 4 crosses, and appeared to be determined by a single factor.

Reaction of the first three crosses to crown rust was determined by 1 factor, resistance being dominant. The reaction of the fourth cross to crown rust was determined by the interaction of four factor pairs, 2 sets of dominant complementary factors. One set, carrying dominant complementary genes for resistance, was derived from the Anthony x Bond parent, while the other set, carrying dominant complementary inhibitor genes epistatic to the genes for resistance, was derived from the Richland x Fulghum parent.

RYE 633.14

980. LJUNG, E. W. 633.14:575(48.5)

Sveriges Utsädesförenings rågförädlingsarbeten. Föredrag vid Sveriges Utsädesförenings årsmöte den 20 juli 1944. (**The rye breeding work of the Swedish Seed Association. Lecture at the annual meeting of the Swedish Seed Association, 20 July, 1944.**)

Sverig. Utsädesfören. Tidskr. 1944 : 54 : 295-315.

The decline in rye growing in Sweden since 1890 and its reasons are discussed, together with the yields of wheat and rye respectively on different soils.

An outline is then given of the rye-breeding work of the Association under the following heads: methods; trials of breeding material and yields, with examples of successes, such as, Stål (Steel), Kungs (Kings) and Kungs II, Sv 37/29 derived from Östgöta Gråråg (Östgöta Grey rye) and others cited below; breeding aims, including winter-hardiness, high grain yield and short straw; methods of grading; good grain quality and its components; absence of tendency to germination in the ear; and progress in breeding and results. This last section outlines breeding trends with descriptions of some of the older and newer varieties evolved (with relevant references to the literature) and their merits, special attention being devoted to the performance of Stål, Kungs Petkus, Agro rye, the unimproved land variety Östgöta Gråråg, Wasa II and Björn.

Among the promising varieties undergoing further tests with a view to possible release for general cultivation are: a new line 0302e derived from Stål whose average yield has surpassed that of Stål; variety 0801b from a cross of Stjärn (Star) x 0280 (from Prof. Heinrich rye), which has a stiff straw and gives a uniform and high yield; a high yielding line b (from Stål x 0280), though rather long in the straw; variety Sv 36/28 (from Malm x Finnish rye), with a considerably higher yield than the two parents; and variety 0460 [from Stål x 0590 (from mid-summer rye)], with a good yield of grain but rather weak straw.

The following aims have still to be realized in Swedish rye breeding: the production of varieties (1) equal to Kungs II in strength of straw, but higher yielding; (2) less sensitive to drought than existing forms; (3) later in germination and therefore with less tendency to germination in the ear; and (4) hardy enough for Norrland, with good stiff straw and also high yield.

981. MÜNTZING, A. 633.14:575.127.5:633.11(48.5)

Rågvetet erbjuder många problem av både teoretisk och praktisk natur. (**Rye-wheat presents many problems of both a theoretical and practical nature.**)

Lantmannen 1944 : 28 : 1023-26.

Comparative experiments with wheat, rye and numerous rye-wheat hybrids showed that in the hybrids tillering capacity was good, but weight of grain per ear averaged only 0.97 gm. as compared with 1.31 and 1.51 gm. for the wheat and rye varieties respectively. Yields from the older rye-wheats A (a Rimpau production) and C (from Russia) were surpassed in grain weight per plot by Nos 08, 09 and 010, which represents F_7 populations of C x A, No. 08 exceeding A by

71% and C by 31%. The rye-wheat types obtained from C x Standard and from Svea II x rye were also quite good and superior to rye-wheats A and C which are derived from foreign wheats unsuited to the Swedish climate.

Rye-wheat No. 014 is characterized by almost optimum stiffness of straw, equalling Stål II [Steel II], but the rye-wheat C is very inferior in this respect, a defect also evident in the C x A hybrids.

With the exception of C, which ripened earlier than rye, the generic hybrids ripened from 0.2 to 3.4 days later.

Quality of grain was not high but the C x A and C x Standard hybrids were awarded 4 marks out of a possible 5. Hectolitre weight was also low but 1000-corn weight showed very high values, equalling 53.0 grm. in No. 06, as compared with 46.6 and 38.4 grm. respectively for Skandia II and Stål.

The fact that the best rye-wheat, No. 08, has double the yield of the worst, No. 011, indicates that with such a range of variation selection should lead to improved yields and this should apply *a fortiori* to all the hybrids that represent mixed populations and are therefore amenable to line selection.

The Ugerup experiments show that rye-wheat has done better on sandy soil than on clay, and in this connexion attention should be paid in future work to qualitative characters such as chemical properties of the grain and baking quality.

Excellent winter hardiness has been recorded for certain types of rye-wheat.

Future work should be based on large scale hybridization with old and new types. The low fertility that prevails in crosses must be investigated.

982. POPOFF, A. 633.14:581.142(43)
Über die Auswuchsneigung des Roggens. (**The tendency towards germination in rye**).
Z. Pflanzenz. 1941 : 23 : 535-41.

Intervarietal and intravarietal differences are reported in the tendency towards germination in the grain of Bulgarian and other ryes.

983. JERMOLJEV, E. 633.14:581.4:575.11
Die Brüchigkeit des Roggens. (**The brittleness of rye**).
Z. Pflanzenz. 1941 : 24 : 59-70.

According to Lada's researches, brittle stem in rye is determined by a single recessive gene. Plants homozygous for this factor produce shorter and thinner straw than the normal and tend to bear smaller ears and grains. The mechanical tissue of the aberrant plants has thinner walls, is softer and less elastic than the normal; the content of inorganic salts and reducing substances is greater, and the content of cellulose and lignin smaller, although the proportion of lignin in the fibre wall is larger.

984. PELSSENKE, P. 633.14:664.641.016
Studien über die Backfähigkeit von Roggensorten. (**Studies on the baking quality of rye varieties**).
Z. Pflanzenz. 1941 : 24 : 1-58.

Extensive details are given on the various characteristics which determine the baking quality of rye varieties. Significant intervarietal differences are important, also the effect of the environment and the stage of maturity of the plants from which samples are taken.

The following characters are considered in detail: protein content, amylase content, glucose content, maltose content, diastatic value (Rohmaltose-gehalt), maltose value after 1 hour's digestion at 27° C. and 62° C. respectively, extent of germination in the grain, amylograph readings, and varietal response to different baking methods.

The relative significance of these components of baking quality is discussed and the degree of correlation between them is examined. Protein content is closely correlated with the amount of dough and bread obtainable from a unit quality of flour. Breeding objectives for the rye breeder are as follows: high protein content, high diastatic value (with special attention to the ratio between the maltose and glucose contents), a gelatinization temperature between 55 and 72° C., and the production of varieties whose amylograph curves reach a height between 400 and 700 units.

985. KULEŠOV, N. 633.15:575(47)
(Maize in the fields of Siberia).

Socialističeskoe Seljskoe Hozjaistvo (Socialistic Agriculture) Moscow 1944 :
No. 1 : 56-62.

Failures in maize crops in Western Siberia in the past have been due largely to the use of unsuitable varieties and methods of cultivation. Recent experiments have shown that the varieties Belojaro Pšeno, Sibirjačka and Pervenec [Firstborn] give consistently good yields, up to 35-40 centners per ha. being obtained under suitable conditions.

986. STADLER, L. J. 633.15:575(73)
Gamete selection in corn breeding.

J. Amer. Soc. Agron. 1944 : 36 : 988-89. (Abst.).

The limited data available indicate rather high variability in yield potential among the plants of open-pollinated varieties, but the frequency of genotypes comparable to the elite lines in both yield potential and general agronomic value is probably too low to make their extraction feasible as a general practice. The method suggested for sampling varietal populations is the testing of the individual F_1 plants obtained by crossing the open-pollinated variety with the inbred line, followed by selection in the S_1 . The variability of the S_1 of the top-cross plants would be comparable to that of the F_2 of unrelated lines.

987. 633.15:575(75.8)
Corn varieties for general planting in South Georgia.

Mimeo. Pap. Ga Coastal Plain Exp. Sta. 1945 : No. 36 : p. 1. (Mimeographed).

The yields of eight early maturing varieties suitable for "hogging-off" are given, with reference to percentage of weevil infestation. The best yields have been secured from Whatley's Prolific and Good's Golden Prolific during the past five years. Florida W-1 is a hybrid maize which has also done well.

988. STADLER, L. J. and 633.15:575.061.6
FOGEL, S.
Gene variability in maize. II. The action of certain R. alleles.
Genetics 1945 : 30 : 23-24. (Abst.).

Alleles of R extracted from unrelated stocks differ widely in their effect upon the distribution and intensity of anthocyanin pigmentation. From the evidence obtained it would appear that the R alleles include 3 more or less independent components, one identified by the effect upon aleurone colour, another chiefly by seedling coloration, and a third chiefly by pericarp colour. Each component may occur at any one of various levels, and apparently any combination of levels of the 3 components may occur together in a single allele.

989. CUTLER, H. C. 633.15:575.113(73)
Medicine men and the preservation of a relict gene in maize.
J. Hered. 1944 : 35 : 291-94.

This article describes how the beliefs of the Callahuayo Indians of the Andes preserved the relict character of pod corn or tunicate maize, and how it was introduced into other parts of the Americas by travelling medicine men.

990. ABBE, E. C. and 633.15:575.115
PHINNEY, B.
Interaction of genes for size and form in maize.
Genetics 1945 : 30 : p. 1. (Abst.).

The genes d_1 , na_1 , nl_2 and py were introduced into the inbred line A 188. The double recessives, d_1 and py , d_1 and nl_2 , na_1 and nl_2 , grew more slowly than the single recessives, and could be easily recognized even in the seedling stage.

991. WELCH, J. E. 633.15:575.116.1:576.356.5(73)
Linkage in autotetraploid maize.

Abstr. Thes. Cornell Univ. 1942 (1943) : 400-03.

Linkage of the genes located in the chromosome 2 linkage group of maize was investigated. Data of asymmetrical coupling showed that in most cases there were no significant differences in

chromosome segregation between observed and expected numbers, suggesting that the degree of linkage of these genes is the same in diploids and tetraploids. In the case of double coupling the observed data did not even approximate the number expected. Cross-over values in the *Lg-Gl2* region were significantly less in both the male and female of the tetraploid than in the diploid. Other differences in cross-over values were not significant.

992. HAYES, H. K.,
RINKE, E. H. and
TSIANG, Y. S. 633.15:575.12(73)
The development of a synthetic variety of corn from inbred lines.
J. Amer. Soc. Agron. 1944 : 36 : 998-1000. (Abst.).

All possible single crosses were studied between 20 inbred lines, and 8 lines were selected that showed relatively good combining ability. The synthetic variety obtained from these lines may be expected to yield about as well as Minhybrid 403. If yield, however, is correlated with moisture percentage at husking, the synthetic variety is not quite equal to Minhybrid 403. Both Minhybrid and the synthetic variety were greatly superior to open-pollinated varieties. The results of these studies emphasize the importance of studying combining ability of the selected material and the probable importance of combining adapted strains of different genetic origin.

993. ANDERSON, E. 633.15:575.12:575.42
The sources of effective germ-plasm in hybrid maize.
Ann. Mo. Bot. Gdn 1944 : 31 : 355-61.

A determination was made of those open-pollinated varieties which have contributed most germ-plasm to six highly successful commercial double-cross hybrids in central Iowa. Twelve of the sixteen inbreds involved were derived from Reid Yellow Dent, three from Krug and three from Lancaster Surecropper. Reid Yellow Dent and Krug were both extensively grown open-pollinated varieties, but Lancaster Surecropper was a variety of only minor importance. The history of Lancaster Surecropper has been obtained from one of the original breeders of the variety. Selection was based on performance and a range of ear types. In the light of this information the possible advantages are discussed of selection for performance and morphological diversity instead of for uniformity, and the need is emphasized for more precise information on the genetics of a field population.

994. STONEBERG, H. 633.15:575.125(76.3)
Louisiana-adapted hybrid corns.
Sth Seedsman 1945 : 8 : No. 3 : p. 18.

Hybrid corn varieties adapted to conditions in Louisiana are described. In 1944 the average increase in yield over the open-pollinated varieties was 31.9%.

995. HULL, F. H. 633.15:575.125:575.42
Recurrent selection for specific combining ability in corn.
J. Amer. Soc. Agron. 1944 : 36 : 989-90. (Abst.).

Recurrent selection in crossbred maize for combining ability with a specific homozygous line is proposed as a means of improving hybrid yield (Cf. Abst. 996).

996. HULL, F. H. 633.15:575.125:575.42
Recurrent selection for specific combining ability in corn.
J. Amer. Soc. Agron. 1945 : 37 : 134-45.

Hybrid vigour is assumed to be the result of the non-linear interaction of genes at different loci or between alleles. The breeding plan here presented is based upon the assumption that in the gene interaction at numerous loci for yield the sum of the effects of the heterozygous condition exceeds the sum of those of the homozygous by 20% or more. The method suggested consists essentially of recurrent selection in a cross-bred lot of maize for yield, with a single homozygous line as tester. The first generation cross of the tester line with the selected cross-bred lot is to be the commercial hybrid, should selection be successful in building up high combining ability.

997. RHOADES, M. M. 633.15:575.246
On the genetic control of mutability in maize.

Proc. Nat. Acad. Sci. Wash. 1945 : 31 : 91-95.

The *Dt* gene, which affects the mutation rate of the gene *a*, has been located at the end of the short arm of chromosome 9.

Goldschmidt's suggestion that published data on the mutability of the gene *a* can be adequately explained in terms of factor interaction, epistasis and threshold values is rebutted.

998. PARENTI, E. 633.15:575.42(45)

Varietà di granturco nane precoci, Bianco dentato precoce friulano. (**Early**

dwarf varieties of maize—Friuli Early White Dent).

Ital. Agric. 1942 : 21 : 651-58.

A full and illustrated account is given of the characteristics of the new variety, Bianco dentato, precoce friulano, and its performance in trials at three farms in the province of Friuli. It was obtained by selection from Wisconsin 7 imported in 1928 by Professor Zapparoli, director of the Bergamo Experiment Station for Maize Culture (Stazione Sperimentale di Maiscoltura di Bergamo). Its suitability for diverse regions and its adaptability to conditions of soil and climate are noted. It is specially adapted to light stony soil of low fertility, in which its vegetative period is 120 days, ripening taking place between the end of August and early September. In good soil the period is longer.

The average production of dry grain under large scale cultivation is about 35 quintals per ha. Under favourable conditions of soil, manuring and cultivation, it has given 90 quintals per ha. of dried grain (with a moisture content of 14%) with a frequent range of from 70-90 quintals per ha.

999. BURNHAM, C. R. 633.15:576.354.4

Chromosome disjunction in maize interchanges.

Genetics 1945 : 30 : p. 2. (Abst.).

In plants heterozygous for interchanges involving chromosome 6 attached to the nucleolus, certain non-disjunctional and certain cross-over spore quartet types may be recognized. A study of such spore quartets was made in plants heterozygous for T5-6c, and either homozygous or heterozygous for an inversion in chromosome 5. In the former case the centromere appeared to exert some effect on disjunction. In the latter the cross-over results appeared to depend on whether the inversion was in the interchanged or the normal chromosome 5.

1000. LONGLEY, A. E. 633.15:576.356(73)

Abnormal segregation during megasporogenesis in maize.

Genetics 1945 : 30 : 100-13.

The cytogenetic data obtained have confirmed the studies of Rhoades (cf. *Plant Breeding Abstracts*, Vol. XIII, Abst. 167) on the preferential segregation at megasporogenesis of the abnormal type of chromosome 10. In addition the data indicate that when such segregation occurs there will be preferential segregation of knobbed over knobless types in other chromosomes heterozygous for knobs.

1001. EINSET, J. 633.15:576.356.4(73)

A cytological and genetic study of primary trisomic types in *Zea mays*.

Abstr. Thes. Cornell Univ. 1942 (1943) : 361-62.

An examination was made of 8 of the 10 possible trisomic types of maize, including the effect of the extra chromosome upon the morphology of the plant. The trisomic plants were in general shorter and produced smaller ears than the disomic plants. A failure to observe the expected 50% transmission of the extra chromosome in the cross $2n \times 1 \text{ } \bar{\text{f}} \times 2n \text{ } \bar{\text{m}}$ in some stocks was evidently due to the loss of the extra chromosome in meiosis. A positive correlation was found between the length of the chromosomes of the trisome and the percentage of transmission.

633.15:581.331.23

1002. MENEZES, O. B. DE 633.15:576.312.34

Tempo de germinação do grão de polen e mitose de um milho brasileiro. (**Rate of germination of pollen grains and mitosis in a Brazilian maize**).

Bol. Soc. Brasil. Agron. Rio de J. 1944 : 7 : 27-32.

Studies of the pollen germination on the stigma were made in the maize Diamantino, using a variety of different treatments. The best method was a modification of the carmine method used by Rhoades, consisting in fixation in 75% alcohol followed by staining in iodine in KI. The pollen germinated 8 minutes after being placed on the stigma.

Data are given of the dimensions of the somatic chromosomes as observed in root tip mitoses.

1003. ANDERSON, E. 633.15:581.46:519.241.1

Homologies of the ear and tassel in *Zea Mays*.

Ann. Mo. Bot. Gdn. 1944 : 31 : 325-44.

Variations in a number of morphological characters were studied in North American maize and varieties from Central and South America. Definite correlations between characters of tassel and ear were established which are of value in practical maize breeding. Positive correlation was found between the following characters: condensation of internodes in the tassel and increase in row number, length of tassel branch and ear length, pattern of tassel branch and shape of ear, tertiary branching in the tassel and irregularity in the formation of ear rows. In North American maize, the relation between condensation of internodes and row number showed considerable exactness, being closely expressed by the equation: condensation index = row number / 10. The geographical distribution of condensation is discussed with reference to controversies relating to the history of maize.

1004. ANDERSON, E. 633.15:581.46:576.16(79.2)

Two collections of prehistoric corn tassels from southern Utah.

Ann. Mo. Bot. Gdn 1944 : 31 : 345-54.

Descriptions are given of two collections of tassels which are approximately contemporaneous and dated at about 1000 A.D. The collections are discussed with reference to present knowledge of the history of maize in the south-western U.S.A.

1005. RICHEY, F. D. 633.15-2.7-1.521.6(73)

Maize hybrids susceptible to earworm. Heritable differences in susceptibility of corn hybrids to early attack.

J. Hered. 1944 : 35 : 327-28.

Data obtained at the Tennessee Agricultural Experiment Station with regard to earworm damage show that strains T13 and T61 impart susceptibility to their hybrids, this susceptibility being greatest in the cross T13 x T61. T18 appears to be definitely resistant, while T14 is intermediate.

1006. SKRABAL, R. 633.15.00.14(43.6)

Standraum und Sorte bei Maisanbau in Trockengebieten. (Spacing and variety in maize growing in dry districts).

Mitt. Landw. 1944 : 59 : 416-18.

A detailed account is given of maize variety trials at 4 centres in Austria in 1942 and 1943. Several land varieties were included in the varieties tested. Results of spacing experiments are also recorded. The experiments were to be continued in 1944.

BARLEY 633.16

1007. SUNESON, C. A. 633.16:581.162.51:575.12(73)

The use of male-sterile in barley improvement.

J. Amer. Soc. Agron. 1945 : 37 : 72-73.

A preliminary report is given of the use of male sterility in barley improvement. Two hybrid populations have been developed at Davis, California. One, designated as Composite Cross XIV (C.I. 7132), was produced by crossing each of eight leading barley varieties on male-sterile C.I. No. 5368-1, and compositing the F_1 seed. The second, designated as Composite Cross XV (C.I. 7133), was derived by bulking F_1 plants from randomly chosen parents, all crossed on the male sterile variety. The pollen parents were drawn from the F_2 and F_3 generations of 3 Composite Cross populations (C.I. 6619, 6620 and 6725) derived from 33 varieties variously combined. Thus, the first population has been obtained from parents with a common adaptation and geographical origin, while the second embodies considerable genetic and ecological diversity, and should give a lower immediate yield than Composite Cross XIV and a much greater diversity in segregation.

1008. MA, Y. H. 633.16-2.4-1.521.6:581.6(51)

(Yield and quality of smooth-awned barley varieties).

J. Agric. Ass. China 1944 : No. 177 : 63-75.

Trial plantings were made in Szechuan during 1940-43 of 7 smooth-awned varieties of barley introduced from Canada. The varieties were: Comfort, Glabron, Spartan, Regel, Newal, Wisconsin Barbless No. 38 and Velvet. Observations were made with regard to yield, vegetative

and grain characters, resistance to diseases, and protein content. Results showed that they all compare favourably with the standard local variety Kingta No. 1. In general, they have stronger stalks, longer spikes, higher grain weight, higher disease resistance and higher protein content. The main drawback is their late ripening.

Among the smooth-awned varieties themselves, the highest yield was found in Comfort, Spartan and Wisconsin Barbless. A high degree of disease-resistance to covered smut, stripe, rust and leaf rust was found in all varieties except Spartan, which is susceptible to stripe. The highest protein content was found in Glabron and Newal, a lower value was observed in Regel, a still lower in Spartan and Barbless, and the lowest in Comfort. Apparently there is a negative correlation between yield and protein content.

H. C. Y.

1009. BRIGGS, F. N. 633.16-2.421.1-1.521.6:575.11
Linkage relations of factors for resistance to mildew in barley.
 Genetics 1945 : 30 : 115-18.

The possibility of linkage between the gene ml_a and either the gene Ml_h or Ml_p was pointed out in a previous paper (cf. *Plant Breeding Abstracts*, Vol. XIV, Abst. 1084). The Psaknon gene Ml_p was identified in the Psaknon variety where it occurs alone. In the variety Duplex the same gene was found along with the gene Ml_h , termed the Hanna factor from its identification in Hanna, and a new recessive gene ml_a named Duplex. The present paper reports further investigations of these genes. Selection No. 175, derived from the cross Duplex x Atlas, carries the Duplex gene only; this selection has been used as one parent in crosses carried out to determine the linkage relations of the three genes. The results indicate that Ml_h and ml_a are independently inherited, and that Ml_p and ml_a are linked, with a cross-over value of 16.38%. Other crosses revealed that these two genes are in turn linked with the factor pair *At at*, for normal and albino seedlings, carried by Trebi I and belonging to linkage group II.

1010. WIEBE, G. A.,
 COWAN, P. R. and
 REINBACH-WELCH, L. 633.16.00.14(73)
Yields of barley varieties in the United States and Canada 1937-41.
 Tech. Bull. U.S. Dep. Agric. 1944 : No. 881 : Pp. 83.

This bulletin presents in tabular form the results of the tests of barley varieties made throughout the United States and Canada during the years 1937-41.

MILLETS AND SORGHUM 633.17

1011. LI, H. W.,
 LI, C. H. and
 PAO, W. H. 633.171:575.127.2:576.354.4:575.11
Cytological and genetical studies of the interspecific cross of the cultivated foxtail millet, *Setaria italica* (L.) Beauv., and the green foxtail millet, *S. viridis* L.
 J. Amer. Soc. Agron. 1945 : 37 : 32-54.

A cross was made between *S. italica*, the cultivated millet, and *S. viridis*, the wild foxtail, in both of which $n = 9$. The pairing of the chromosomes in the F_1 hybrid was evidently normal. The hybrid, however, had approximately 70% pollen sterility. The F_1 hybrid resembled *S. viridis* in all the qualitative characters studied with the exception of pericarp colour. Altogether 15 gene differences with 3 linkage groups were revealed in the F_2 generation and were confirmed in the F_3 generation. Other genes appeared to be inherited independently of these three groups and of each other. The cytogenetic evidence suggests that the evolution of *S. italica* from *S. viridis* is recent.

1012. LI, C. H. and
 LI, H. W. 633.171:576.356.4(51)
Supernumerary chromosomes in pearl millet (*Pennisetum typhoideum* Rich.)
 Chinese J. Sci. Agric. 1943 : 1 : 139-41.

Abnormal plants of *Pennisetum typhoideum* Rich. are described with chromosome numbers of $2n + 1$, $2n + 2$ and $2n + 3$, which were probably derived from a triploid plant.

1013. YU, T. F. 633.171-2.411.4-1.521.6:575(51)
Reaction of improved millet varieties to infection with downy mildew
(Sclerospora graminicola Schroet).
 Chinese J. Sci. Agric. 1944 : 1 : 199-203.

Several varieties of foxtail millet have been produced which are highly resistant to kernel smut. Among these improved varieties, Tsinan-Nanking No. 2 and Kaifeng No. 48 have already been released for general cultivation. An investigation has also been made of the reaction of the several varieties to downy mildew (*S. graminicola* Schroet.) In a three-years' test only Tsinan-Nanking No. 2 has proved to be resistant, while the rest of the varieties show some degree of susceptibility. Kaifeng No. 48 is classed as a moderately susceptible variety, showing 7-20% infection under experimental conditions and a number of diseased plants in the field.

1014. WANG, C. D. 633.171-2.451.2:576.16:631.521.6
Physiologic specialization and the control of millet smut.
 Phytopathology 1944 : 34 : 1050-55.

Certain varieties of millets were highly resistant to several races of *Ustilago Crameri*, but no variety was resistant to all races. The data obtained indicate that in breeding millet varieties resistant to the disease the prevalence of physiological races must be considered.

1015. LEUKEL, R. W.,
 MARTIN, J. H. and
 LEFEBVRE, C. L. 633.174-2-1.521.6
Sorghum diseases and their control.
 Fmrs' Bull. U.S. Dep. Agric. 1944 : No. 1959 : Pp. 46.

In the discussion of the control measures in the case of each disease of sorghum this bulletin refers to the measure of resistance shown by the groups and varieties of sorghum.

1016. HOFFMASTER, D. E. and
 TULLIS, E. C. 633.174-2.485-1.521.6(73)
Susceptibility of sorghum varieties to *Macrophomina* dry rot (charcoal rot).
 Plant Dis. Reporter 1944 : 28 : 1175-84. (Mimeographed).

A study has been made of susceptibility to *Macrophomina* dry rot in 232 varieties and strains of sorghum. The large groups showed a general tendency in their reaction to the disease. The sorgos and kafirs and particularly the black hull kafirs show a tendency towards resistance. The kafir-milos are moderately susceptible. The milos are the most susceptible as a group. The possibility of developing more resistant varieties appears to exist, although at present no varieties can be recommended for localities where dry rot is important.

RICE 633.18

1017. GUŠČIN, G. G. 633.18:575(47)
(Programme of work on rice breeding for the third 5-year plan. Items of the report).
 Trudy Risovoï Opytnoï Stancii NKZ, S.S.S.R. (Transactions of the Rice Experiment Station of the U.S.S.R. People's Commissariat of Agriculture) 1937 (1938) : No. 9 : 128-31.
(Plan of work on rice breeding for the third 5-year plan. Resolution by G. G. Guščin on the report of the deputy director of the Rice Experiment Station of the NKZ, U.S.S.R.).
 Ibid 1937 (1938) : No. 9 : 132-33.

The first paper reveals that in spite of the establishment in the U.S.S.R. of the Rice Institute in 1932 (now called the Rice Experiment Station of the N.K.Z.) rice breeding in that country has not, for various reasons, advanced beyond the formulation of a general plan of research and the selection of initial breeding material. The Far-Eastern Regional Rice Experiment Station is, however, cited as an exception which, owing to its nearness to Northern Manchuria and Japan, has been able to utilize material for breeding forms suitable to the conditions of the region served by the station. Some progress has also been made by using the world collection of rice varieties to create groups of élites for each of the rice growing areas.

The failure to exploit the natural resources of the country as regards rice growing is attributed to faulty methods of cultivation by workers raising the crops.

The programme for the period in question comprises: (1) detailed bio-climatic studies of the rice growing regions of the U.S.S.R. and the selection and production of varieties suited to these areas; (2) selection and production of (a) early varieties for cultivation in northern latitudes, (b) of varieties tolerant to salts for regions such as Terek, Manyč, the lower Volga, Southern Kazakhstan and Uzbekistan, and (c) of varieties that will produce high yields of good quality with only periodic irrigation; and (3) the study of the phasic development of rice, the components of yield and methods of producing forms giving the maximum yield, disease immunity and its physiological basis, the characters whereby it can be identified and its inheritance, tendency to shedding and lodging and their inheritance, salt tolerance and a technique of a mass identification of forms exhibiting it, and the ecological study of the potentialities of *Oryza* L., enlargement of the collection and its systematic classification, etc., for breeding purposes.

Breeding work is to be suitably regionalized according to a detailed plan and the main theoretical research will be carried on at the above mentioned station in collaboration with the other stations of the Soviet Union.

In the second article, acceptance of the scheme outlined in (1) above is recorded, with the following additional undertakings *inter alia*: speeding up (by the methods elaborated at the Uzbekistan and Krasnodar stations) of the multiplication of new promising varieties produced by the various rice stations and recording of the amount of seed available per annum; conducting of variety trials, large and small, in the testing of promising and also insufficiently tested varieties; the utilization of the Chief Cotton Board for the large scale production of new varieties and the recording of the quantities of seed available per year and also for trials of varietal mixtures at the various stations; the selection for cyclic crossing of pairs representing different ecological types; the application of technological, biochemical and nutritional determinations to improve quality; and the search for economically valuable forms of local varieties for breeding purposes.

1018. KUANG, H. H.,
TU, D. S. and
CHANG, Y. H. 633.18:575.12(51)
Tung Pu Loa, a natural hybrid in rice.
Chinese J. Sci. Agric. 1944 : 1 : p. 182.

A natural hybrid, "Tung Pu Loa", is reported between glutinous and non-glutinous types of rice in Szechuan.

1019. KUANG, H. H.,
TU, D. S. and
CHANG, Y. H. 633.18:581.48:575.11(51)
Genetical studies on the polyhusks in cultivated rice (*Oryza sativa* L.)
Chinese J. Sci. Agric. 1943 : 1 : p. 125.

Polyhusk is an abnormal character, glumes additional to the normal ones being produced. In the F_2 of the crosses, normal husked Mao-Tze-Tou x polyhusked Shui-Pei-Tiao and normal husked Su-Shih-Tze x polyhusked Lin-Shui-Tao, the character is inherited as a simple recessive gene, which was designated g_1 . Segregation, however, in the F_2 progeny of the cross normal husked Tze-Ta-Hei x polyhusked Lin-Shui-Tao indicates a triplicate mode of inheritance, the genes in this case being designated g_1 , g_2 and g_3 . The character of polyhusk shows no linkage with dwarfness and six other morphological characters that were studied.

1020. LO, T.-Y. and
WU, C.-H. 633.18:581.6(51)
The buffer action of the Chinese rice-meal extracts.
Chinese J. Sci. Agric. 1944 : 1 : 195-98.

The titratable acidity, hydrogen ion concentration and buffer action of meal extracts have been studied in nine Chinese varieties of rice.

1021.

HARDISON, J. R.

633.21-2.421.1:576.16

633.21:575.127.2:575

Specialization of pathogenicity in *Erysiphe graminis* on *Poa* and its relation to bluegrass improvement.

Phytopathology 1945 : 35 : 62-71.

Pathogenic specialization has been observed in *E. graminis* infecting the genus *Poa*. Several economic and wild species of *Poa* have shown marked resistance to the 5 distinct cultures obtained.

The advantages are discussed of hybridization between *Poa arachnifera* and *P. pratensis* in the improvement of Kentucky bluegrass. The 2 main advantages of hybrids between these 2 species are (1) the possibility of inheritance of disease resistance from *P. arachnifera* and (2) their fertility. The fact that the hybrids are fertile suggests that this particular cross may alleviate breeding difficulties due to apoximism in *P. pratensis*.

1022.

BURTON, G. W.

633.261:575.12:575

Much maligned Bermuda . . . now a profit item.

Sth Seedsman 1945 : 8 : No. 3 : 16, 34.

The new hybrid variety, Coastal Bermuda, has been selected from a large number of hybrids between superior native Bermuda grasses and introductions from South Africa and Asia. Coastal Bermuda has larger leaves, stems, rhizomes and stolons than the common Bermuda grass, and grows much taller and spreads more quickly; it is highly palatable. It is resistant to leaf spot and shows more drought resistance than the Bermuda grasses. It produces very few seed heads and these rarely contain viable seed. Its vegetative propagation is therefore essential. The range of adaptability has not yet been established.

1023.

STEBBINS, G. L. (jun.),

TOBGY, H. A. and

633.262:576.354.4:578:575.12

HARLAN, J. R.

Alice Eastwood Semi-Centennial Publications. No. 13. The cytogenetics of hybrids in *Bromus* II. *Bromus carinatus* and *Bromus arizonicus*.

Proc. Calif. Acad. Sci. 1944 : 25 : 307-21.

A new species, *B. arizonicus* is described, based on *B. carinatus* v. *arizonicus* Shear. This species has the somatic chromosome number $2n = 84$, as compared with $2n = 56$ for *B. carinatus*. The hybrid *B. arizonicus* x *B. carinatus* can only be obtained when *B. arizonicus* is the female parent. It is morphologically intermediate between its parents and is completely sterile. At meiosis this hybrid regularly shows a maximum of 7 trivalents, the remainder of the chromosomes existing as bivalents and univalents. The 7 large chromosomes obtained from *B. carinatus* have no homologues in *B. arizonicus*, and are therefore always unpaired, as are also 14 medium-sized chromosomes from *B. arizonicus*.

The cytogenetic evidence fully demonstrates the specific distinctness of *B. carinatus* and *B. arizonicus*. The hypothesis is advanced that *B. arizonicus* is an allopolyploid derived from doubling of the chromosome number in a hybrid between *B. catharticus*, or a close relative of that species, and some other species with 21 pairs of medium-sized chromosomes, not belonging to the subgenus *Ceratochloa*. The relationship of *B. carinatus* and *B. arizonicus* is described as that of allozygotic amphidiploids. The cytogenetic evidence obtained supports the retention of *Bromus*, sens. lat., as a single genus.

1024.

HARLAN, J. R.

633.262:581.46:581.02

Cleistogamy and chasmogamy in *Bromus carinatus* Hook and Arn.

Amer. J. Bot. 1945 : 32 : 66-72.

An account is given of the effect of environmental conditions on *B. carinatus* in respect of the development of cleistogamic or chasmogamic flowers.

1025.

CHAMBERLAIN, D. W. and

633.262-2.421.9-1.521.6

ALLISON, J. L.

A brown leaf spot on *Bromus inermis* Leyss. caused by *Pyrenophora bromi* (Died). Drechsler.

Phytopathology 1944 : 34 : 997-98. (Abst.).

A brown leaf spot disease in smooth brome grass is caused by *Pyrenophora Bromi*. Inbred lines of smooth brome studied in Wisconsin were found to differ markedly in reaction to the disease.

1026. HILL, H. D. and MYERS, W. M. 633.263:576.356.5:581.04:581.165(73)
Isolation of diploid and tetraploid clones from mixoploid plants of ryegrass (*Lolium perenne* L.), produced by treatment of germinating seeds with colchicine.
 J. Hered. 1944 : 35 : 359-61.

Pairs of diploid and tetraploid clones were isolated by vegetative propagation from colchicine-treated plants of *L. perenne* L. Pure clones were established, by the use of single tillers for propagation and the determination of chromosome numbers of the root tips in successive generations. There was no observable tendency for one type of tissue to develop at the expense of the other, and no noticeable difference in the ease with which pure diploid or tetraploid material was obtained. Mixtures of $2n$ and $4n$ tissue persisted in some clones through eleven vegetative generations.

1027. PORTER, C. L. 633.264:582(78.7)
Studies in Wyoming grasses. V. Tribe *Festuceae*, the fescue tribe.
 Univ. Wyo. Publ. Sci. 1944 : 11 : 13-36.

The *Festuceae* are described taxonomically, with reference to the economic uses of each genus.

1028. PORTER, C. L. and LANG, R. 633.285:582
 633.287:582
 633.289:582
Studies in Wyoming grasses II. Tribe *Agrostideae*—the red top tribe.
 Univ. Wyo. Publ. Sci. 1941 : 8 : 33-52.

PORTER, C. L.
Studies in Wyoming grasses III. Tribe *Chlorideae*, the grama grasses.
 Ibid. 1941 : 8 : 53-58.

PORTER, C. L.
Studies in Wyoming grasses. IV. Tribe *Hordeae*, the barley grasses.
 Ibid. 1942 : 9 : 17-31.

These three papers describe respectively the taxonomy of the *Agrostideae*, *Chlorideae* and *Hordeae*, and refer to the economic value of each genus.

LEGUMINOUS FORAGE PLANTS 633.3

1029. COUTINHO, L. DE A. 633.3-2.8:575.243
 O "mosaico das leguminosas" agente perturbador da hereditariedade?
 (Mosaic of leguminous plants as an agent disturbing the hereditary mechanism?)
 Agron. Lusitana 1942 : 4 : 273-92.

This is an extended version of the work referred to in *Plant Breeding Abstracts*, Vol. XIV, Abst. 222.

1030. KIRSANOVA, V. A. 633.31:577.16
 (The control of vitamin C and carotene in lucerne varieties of the Uzbek S.S.R.).
 Biohimija (Biochemistry) 1944 : 9 : 113-18.

Most of the vitamins required by man are present in the leaves of lucerne. Hot weather reduces the amount which, therefore, is largest in early spring, in autumn, and during warm spells in winter. In the experiments described, only vitamin C and carotene were considered. Vitamin C may amount to 1.5% and rarely 2%, being present in largest amount in the leaves of young plants and at a maximum during bud initiation. The largest quantity of carotene was found in the leaves of lucerne after the third cut, being usually at a maximum during bud initiation. Certain varieties of lucerne have already been found by plant breeders to be richer in vitamins and carotene than others.

I. Z.

1031. KOPERŽINSKII, V. 633.31:581.162.3

(New data on the structure of the lucerne flower).

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : No. 7 : 19-21.

The structure of the *Medicago sativa* floret is described, and its adaptation to visits by wild bees but not hive bees is explained. The spring-like mechanism of the floret strikes and dazes the hive bee which, therefore, when collecting nectar instinctively chooses a method of penetrating the floret without opening it. For the production of lucerne seed, wild bees must be relied on for pollination. I. Z.

1032. SCHRÖCK, O. 633.31:581.6:519.24

Untersuchungen über die Möglichkeit der Verwendung der Korrelationen in der Züchtung der Luzerne auf Eiweissreichtum. **(Experiments on the possibility of utilizing correlations in the breeding of lucerne for high protein content).**

Züchter 1942 : 14 : 234-40.

Investigations into the individual and correlated variability of morphological and biochemical characters of lucerne are reported. Phenotypic variation was found to be so pronounced that genotypic differences between lines were often masked. The various characters tended to vary independently of each other, the extent of variation being itself variable and influenced by environmental conditions. A marked variation was also noted between the characters of some individual plants examined in two successive cuttings.

Certain significant correlations between protein content and other characters were established, but the author concludes that they are not of sufficient value to be of much use in practical breeding.

1033. TOEVS, J. L. 633.31-2.3-1.521.6:581.6(79.2)

New regional alfalfa varieties show promise.

U. and I. Cultivator 1944 : 4 : No. 4 : 10, 26.

The results of tests of seven alfalfa varieties are reported. The stands of the varieties Grimm, Cossack and Kansas Common were reduced by wilt to less than 50 per cent. by the end of the 1944 season. Ladak shows some resistance to wilt, and may be used with advantage when hay stands are left longer than two years and where only two cuttings are harvested per year. Ranger and Buffalo combine satisfactory wilt resistance with good production. Orestan is partly resistant to wilt and a consistent producer of good crops.

1034. JULÉN, G. 633.321:575:581.6

Några rödklöverstammars avkastning och kvalitet i försök vid Svalöf 1933-1942. **(The yield and quality of some red clover strains in experiments at Svalöf 1933-1942).**

Sverig. Utsädesfören. Tidskr. 1944 : 54 : 332-38.

This is a survey of the work on the selection and breeding of red clover already recorded in full and statistically analysed by Julén in 1943. (See *Herbage Abstracts*, Vol. 15, No. 5).

1035. BAUR, G. 633.321:581.162.32:575.11

Kreuzbefruchtung (Pärchenzüchtung) bei Rotklee in ihrer Bedeutung für die praktische Züchtung. **[The significance of cross-pollination (breeding by pairs) in red clover for practical breeding].**

Z. Pflanzenz. 1941 : 23 : 611-37.

Red clover lines have been cross-pollinated and the progenies inbred, in order to observe the effect on fertility, morphological uniformity and vegetative vigour. Great variation in the set of seed of the various progenies was found, and this is attributed (a) to experimental difficulties, (b) the effect of the environment, (c) the operation of incompatibility factors, and (d) the effect of inbreeding. Segregation in the F_2 and later generations was observed for fertility and vegetative vigour. Families characterized by considerable morphological uniformity could be raised from the lines showing little inbreeding depression. Observations on the genetics of flower colour, leaf marking and leaf colour are recorded, and discussed in the light of the relevant literature. Correlations between the various characters are considered, and the relative yielding capacity of genetically homogeneous and heterogeneous clover swards is discussed.

1036. ATWOOD, S. S. 633.322:581.162.52:575.11:575(73)
The value of self-compatibility in breeding white clover.

J. Amer. Soc. Agron. 1944 : 36 : p. 990. (Abstr.).

From studies of self-compatibility, it was concluded that the S_f gene may be useful in facilitating inbreeding. Four lines of investigations have been carried out, to obtain further information concerning the behaviour factors which will condition the ultimate method of using this S_f gene:

(1) In a heterozygous S_f plant, the two types of gametes were produced in approximately equal numbers, but when the pollen was placed upon the stigma of a plant bearing two other alleles, the S_f pollen produced less than one quarter of the resultant progeny.

(2) When a heterozygous $S_f S_x$ plant was crossed as male with a self-incompatible plant bearing S_x , the S_x pollen was completely inhibited, in spite of its association with S_f .

(3) In a heterozygous $S_f S_y$ plant used as female, the S_f functioned as a partly dominant factor when all pollen would normally have been inhibited ($S_x S_x$), permitting some set of seed, but the oppositional effect was not disturbed by S_f when only part of the pollen was inhibited ($S_x S_y$).

(4) Homozygous $S_f S_f$ plants were obtained in the expected frequencies from the selfing or intercrossing of heterozygous S_f plants. Such homozygous plants may prove useful in breeding, as the few so far tested have imparted considerable vigour and good seed setting capacity to their F_1 progenies.

1037. BLACK, C. A. and
 LAWTON, K. 633.366:581.192
Iowa soils need nitrogen.

Fm Sci. Reporter, Iowa 1945 : 6 : 14-16.

The nitrogen content and yield of organic matter at the end of the first year of growth have been analysed in several varieties of sweet clover.

1038. KLINKOWSKI, M. and
 HACKBARTH, J. 633.367:581.6(43)
 Zur Kenntnis der züchterischen Bedeutung iberischer Wildformen von
Lupinus luteus L. und *L. angustifolius* L. (Information on the significance
 for breeding of Iberian wild forms of *L. luteus* L. and *L. angustifolius* L.)
 Z. Pflanzenz. 1941 : 23 : 579-610.

Details are given of the following characteristics of a series of forms of *L. luteus* and *L. angustifolius* collected from Spain and Portugal; plant height and habit, length of inflorescence, number of shoots, number of pods on the principal shoot, total number of pods, length, breadth and thickness of pods, number of seeds per pod, number of seeds per plant, colour and shape of seeds, thousand seed weight, flower colour, leaf morphology, flowering time, ripening time, mode of vegetative development, alkaloid content, and protein content. The forms which should prove useful to breeders are indicated.

1039. JOSEFSSON, A. 633.367:581.6:575"793"(48.5)
 Blå sötlupin till mogen skörd. (Sweet blue lupins that ripen seed).
 Lantmannen 1944 : 28 : 1005, 1009.

The sweet blue lupin has so far been used in Sweden only for forage and silage purposes; its seed yield is very low and this has been a handicap to the extension of its cultivation even for these purposes. The bitter form on the other hand gives a good yield of seed. Swedish bitter blue lupins have therefore been crossed with German sweet blue. From this cross a number of promising sweet lines have been produced, which are now being tested on a large scale. The two best have in the last two years given yields corresponding to 90% of that from the bitter form; on very indifferent, unmanured sandy ground they have yielded 3000 kg. of seed per hectare. They still ripen somewhat later than the bitter form and further back-crosses are to be made in the hope of improving both earliness and yield.

It was found that 0.86 kg. of blue sweet lupin seed was equivalent to 1 feeding unit and this contained as much as 273 grm. of digestible protein.

1040. KLINKOWSKI, M. 633.376:581.162.32
 Zur Frage der Fremdbefruchtung der Serradella. (The question of cross-
 pollination of serradella).
 Züchter 1942 : 14 : 240-43.

By growing in close proximity rows of serradella (*Ornithopus sativus* Brot.) with different coloured

flowers, it has been shown that hybridization occurs, the F_2 progenies of the hybrids exhibiting a segregation for flower coloration. The results could not be interpreted satisfactorily by the supposition that the F_1 hybrids were mutants. It is concluded therefore that serradella is not necessarily self-pollinated as previous authors have supposed.

1041.

TRANKOWSKY, D. A.

633.378:576.312.34

633.378:576.312.35

[The chromosomes of certain species of vetch (*Lathyrus*)].

Učenyje Zapiski Moskovskogo Gosudarstvennogo Universiteta. Trudy Instituta Botaniki (Scientific Proceedings of the Moscow State University.

Transactions of the Institute of Botany) 1940 : 36 : 102-11.

The previous literature on the cytology of *Lathyrus* species is outlined; all have so far proved to have 14 somatic chromosomes. The seventeen species examined by the present author also had $2n = 14$. The morphological characteristics of the chromosomes are described and figured for *L. sativus* L., *L. annuus* L., *L. Gorgoni* Parl., *L. Cicera* L., *L. odoratus* L., *L. tingitanus* L., *L. silvester* L., *L. latifolius* L., *L. hirsutus* L., *L. tuberosus* L., *L. Aphaca* L., *L. articulatus* L., *L. Clymenum* L., *L. Ochrus* L., *L. pisiformis* L., *L. pratensis* L., and *L. sphaericus* Ritz.

Almost every species has 1 or 2 pairs of characteristic chromosomes which serve to distinguish it from other species.

ROOTS AND TUBERS 633.4

1042.

MUNERATI, O.

633.41:581.143.32:575

Über die Möglichkeit bei *Beta vulgaris* L. Rassen mit zahlreichen Anomalien der Keimlinge getrennt zu züchten. (The possibility of breeding races of *B. vulgaris* L. distinguished by frequent seedling aberrations).

Züchter 1942 : 14 : p. 253.

It has been found possible to increase the frequency of beet plants exhibiting abnormal cotyledonary arrangements in a particular strain, by selecting large numbers of aberrant individuals and crossing these *inter se* for several generations.

1043.

SUN, V. G.

633.42:576.312.35:575.12:582(51)

A note on "Tsontsai".

Chinese J. Sci. Agric. 1943 : 1 : 143-46.

Tsontsai, a vegetable occasionally cultivated in Kweichow, has been named *Brassica juncea* Coss. var. *linearifolia* Sun. The plant differs markedly in general appearance from other varieties of *B. juncea*. It crosses readily, however, with other varieties of *B. juncea*, fertile F_1 hybrids being produced, but does not cross readily with other species. Cytological investigation has shown that it has a chromosome number of $n = 18$.

1044.

SCHWANITZ, F.

633.42:581.331.23:576.356.5

Über die Pollenkeimung einiger diploider Pflanzen und ihrer Autotetraploiden in künstlichen Medien. (The pollen germination of some diploid plants and their autotetraploids in artificial media.).

Züchter 1942 : 14 : 273-82.

Experiments have been made to compare the mode of pollen germination of diploid and artificially-induced autotetraploid strains of *Brassica Rapa* L. var. *sylvestris* f. *biennis*, *B. oleracea* var. *capitata* L. f. *alba* Copenhagen Market x *B. oleracea* var. *acephala* DC. f. *sabellica* L. Erfurter Halbhoher Mooskrauser, *Sinapis alba* L., *Raphanus sativus* var. *sinensis* L. and *Rumex patientia* L. In all cases the haploid pollen of the diploid strains germinated the more readily and fewer burst pollen tubes were found than in the pollen from the tetraploids. In both cases, however, the optimum medium for pollen germination was the same. The causes determining these observations are discussed and it is suggested that the tetraploids are less physiologically efficient, probably owing to their larger cell volume.

1045.

STEVENSON, F. J.

633.491:575

Potato breeding, genetics, and cytology: review of recent literature.

Amer. Potato J. 1945 : 22 : 36-52.

Recent literature is reported under the following headings: (1) research in potato breeding; (2) tuber and flower development in relation to length of day; (3) pollination techniques; (4) self-incompatibility; (5) cytology; (6) seed germination and viability of potato seeds; (7) dry matter and starch content; (8) dehydration; (9) resistance to viruses; (10) late blight investigations; (11) scab tests; and (12) new varieties.

1046. DELANEY, D.
The potato crop. 633.491:575(41.5)

J. Dep. Agric. Éire 1944 : 41 : 290-94.

This broadcast talk refers to the qualities and uses of a number of the older varieties, and describes three of the newer varieties, Doon Éire, Ulster Chieftain and Dunbar Rover.

1047. WHEELER, E. J.,
 STEVENSON, F. J. and
 MOORE, H. C. 633.491:575(73)

The Menominee potato: a new variety resistant to common scab and late blight.

Amer. Potato J. 1944 : 21 : 305-11.

Menominee is a selection from a cross of Richter's Jubel and Seedling No. 44537. Seedling 44537 was a russet mutation from the cross Chippewa x Katahdin, which was low-yielding but scab resistant. Menominee is highly resistant to scab, moderately resistant to late blight, and is late in maturing. Tests in Michigan show that if this variety is planted early it will produce relatively high yields of good cooking quality. Menominee has yielded consistently more bushels of U.S. No. 1 tubers per acre than Chippewa, Russet Rural or Sebago. In Maine, however, where it was first produced, the variety has not been promising except in scab resistance.

1048. ERWIN, A. T. 633.491:575(77.7)
The Federal potato breeding program.

Trans. Ia St. Hort. Soc. 1942 : 77 : 336-40.

In the past ten years the United States Department of Agriculture, in co-operation with a number of experimental stations, including Iowa, has been engaged in a potato-breeding programme. At least eight varieties have been introduced. The qualities and distribution of four of these are described, Katahdin, Chippewa, Warba and Sebago.

In Iowa crosses have been made representing practically all the American varieties and certain foreign varieties of value on account of their scab resistance. Three crosses, 528 x 118, 528 x 194, 528 x 229, with Richters Jubel as one parent, are worth particular mention. In scab-foul soil, tubers of these crosses showed only a limited amount of shallow type of scab, whereas Irish Cobbler in the check rows was so deeply pitted as to be unmarketable. None of these seedlings are as early as Cobbler, but this could hardly be expected as scab resistance and lateness appear to be genetically linked. Five crosses from the Hindenburg series are also promising. An Irish Cobbler seedling which is early, smooth, shallow-eyed, and superior to its parent, has been obtained, but it is emphasized that this seedling is not scab resistant.

1049. EDMUNDSON, W. C.,
 SCHAAL, L. A. and
 BINKLEY, A. M. 633.491:575(78.8)
The Pawnee potato.

Circ. U.S. Dep. Agric. 1943 : No. 665 : Pp. 6.

The Pawnee potato is a new variety, produced from a cross between Rural New Yorker No. 2 and Katahdin, which is believed to be a valuable medium-early variety for cultivation in certain districts. The general adaptation of the variety is not yet known. It has proved to be a promising variety for both the early and late crop in the Greeley district, Colo., where it has produced good crops of smooth tubers, uniform in size with shallow eyes and relatively tough skin. Preliminary tests indicate that it will be valuable in other States.

1050. GLUSHCHENKO, I. 633.491:575.25
 635.64:575.257
(On the problem of genetic heterogeneity in plant tissues).

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : Nos. 5-6 : p. 35.

By propagating from the adventitious buds on various potato varieties, white or yellow progenies were obtained from coloured parents. In some varieties the second and third generations from the altered tubers gave constant progeny, while in others partial or complete reversions occurred. In the progeny of the variety Žarnica vegetative segregation occurred, different tubers on the same plant having different colours. Variation of a similar kind was observed in other characters. It is ascribed to genetic differences between different tissues of the plant.

In the third seed generation from tomato grafts of Golden Queen on Ficarazzi, Golden on Mexican 353, Golden Queen on Humbert and Planovyĭ [Planned] on Gruševidnyĭ [Pear-shaped] plants were found which bore, sometimes within a single cluster, fruits differing in colour, number of locules and biochemical properties.

1051. TURLAPOVA, A. 633.491:575.257:581.6
(Development of an early industrial variety of potato by grafting).
 Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : Nos. 5-6 : 28-30.

It has so far not been possible to produce by ordinary breeding methods an early maturing potato with the high starch content required for alcohol manufacture. In 1939, 600 grafts were made of starchy varieties such as Wohltmann and Korenevskii on to the early variety Early Rose; 87% of the grafts were successful. The mutual influence of stock and scion was observed in the flower colour and in the form and colour of the tubers. Segregation for tuber characters was observed in the "first generation from the grafted plants", and in later generations of 3 selected hybrids all the tubers were white, though they often had pink eyes. All 3 selections exceeded Early Rose in yield of tubers (by 8-20 c. per ha.) and in starch content (by 1-6.4%); No. 400 had a starch content of 22.6% in 1942. The yield of starch per hectare was 5-6.8 c. more than that from Early Rose in 1942 and 9-11 c. in 1943.

The new hybrids were a few days later than Early Rose in maturity but the tubers reached the maximum starch content earlier than Early Rose, a feature of great importance for industrial purposes.

1052. TUSHNIAKOVA, M. 633.491:575.257:581.6
(Grafting of alkaloid plants). 635.64:575.257:581.6
 Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : No. 10 : 24-31.

Grafts of various solanaceous species one on the other were examined for their alkaloid content and it was shown that when a species that normally contains no alkaloid (black nightshade, tomato or potato) is grafted on to a species that contains alkaloid (nicotine or atropine), then alkaloid is developed in the scion. In the reverse grafts, using an alkaloid-free species as root-stock, plants such as tobacco, belladonna, *Datura* and *Hyoscyamus* formed scions in which the alkaloid was either absent or present in very small quantities.

A potato grafted on to *Datura inermis* Jacq. for example contained 0.3% of atropine; it formed aerial tubers and these when sown gave rise to plants which contained up to 0.15% atropine in their leaves, stems and tubers.

The first generation of a tomato grafted on to *Nicotiana rustica* contained 0.73% nicotine in the fruits; this fell to 0.3% in the second generation and 0.2% in the third.

On the other hand *Atropa Belladonna* L. scions grafted on to potato were entirely free from atropine. Their first generation contained 0.15% atropine (average for 10 plants) as against 0.35% in the control plants of belladonna.

Belladonna scions grafted on tobacco contained 0.64% nicotine and only traces of atropine; the first generation contained 0.34% atropine and 0.2% nicotine in 1942 and 0.31% atropine and 0.15% nicotine in 1943.

Datura Stramonium L. grafted on tomato produced a first generation with 0.1% atropine as compared with 0.25% in the control.

In grafts of tomato on *N. rustica* the nicotine content diminished with each successive generation. In 1942 among the progeny of Bison tomato grafted on to potato one plant was found which produced 3 small tubers on its roots; from them 3 peculiar potato plants were produced, which formed a mass of aerial tubers on their stems, some sessile and others in short stalks, together with a number of small underground tubers. Both aerial and subterranean tubers were planted and gave rise to plants of the same type, again forming both aerial and underground tubers.

1053. BUSHNELL, J., 633.491:576.354.4:575
 SLEESMAN, J. P. and 635.64:575.257:581.6
 STEVENSON, F. J. 633.491-2-1.521.6:575
Erie, a late potato, adapted to Ohio.
 Amer. Potato J. 1945 : 22 : 29-32.

Erie is a new high-yielding variety adapted to conditions in Ohio. It has been obtained from the cross Seedling 45146 x Earline. The tubers are spherical with moderately deep and fairly numerous eyes. The variety is, however, as susceptible to scab as any of the established varieties.

1054.

LAMM, R.

633.491:576.354.4:581.162.5:576.356.5:581.04

633.491:575.127.2

Cytogenetic studies in *Solanum*, sect. *Tuberarium*.

Hereditas, Lund 1945 : 31 : 1-128.

A study has been made of primary and secondary polyploidy, incompatibility and sterility, within the subgenus *Tuberarium* of *Solanum*, mainly by means of cytological investigation of species, interspecific hybrids and colchicine-induced polyploids.

In the diploid species, sterility and chromosomal aberrations appear to be causally related. In slightly inbred progenies of the allogamous diploid species *S. Rybinii* and *S. stenotomum*, considerable variations in pollen fertility were observed between plants. Most of these plants, and in addition two male sterile plants, were characterized by inversions and translocations.

A diploid tetraploid chimaera of asynaptic *S. Rybinii* was obtained by treatment of the seed with colchicine. In several respects these asynaptic plants resemble "sticky" maize.

The method of grafting on tomato was applied in hybridization. The pollen fertility of the autogamous tetraploid species *S. acaule* was unaffected by grafting, the pollen fertility of the variety Deodora of *S. tuberosum* showed a decrease. The effect upon fertility of doubling the chromosome number was studied mainly in *S. Rybinii* and *S. acaule*. Fertility showed considerable variation, according to the genotype of the diploid. Colchicine-induced octoploids of *S. tuberosum* have exceptionally high fertility.

Secondary association was studied in diploid, triploid and tetraploid plants of different species. The results of the analysis were too diverse to establish the original basic chromosome number of *Solanum*. The most interesting observation was that the degree of secondary association in the asynaptic *S. Rybinii* is very low.

The crosses *S. Chaucha* (triploid) x *S. stenotomum* (diploid) and *S. Chaucha* x *S. tuberosum* were made.

S. curtilobum (pentaploid) as maternal parent crosses readily with *S. tuberosum* and *S. andigenum*; the F_1 hybrids are comparatively fertile. The reciprocal cross is difficult to achieve, but was obtained by grafting the maternal parent on tomato. F_1 hybrids of this cross are completely male sterile and also show a much reduced female sterility. Meiosis in the first cross is normal, in the latter abnormal.

Hybridization between *S. acaule* and *S. tuberosum* failed. After chromosome doubling in *S. acaule*, hybrids were easily obtained, *S. acaule* being used as female parent. The hexaploid and approximately hexaploid F_1 hybrids are fertile.

The nature of the differences between the diploid species of *Tuberarium* is discussed. On the basis of present knowledge it is impossible to say whether these species are autogenomic or not. In the case of the tetraploid species it is suggested that *S. tuberosum* is mainly an autotetraploid but, compared with the true colchicine-induced autotetraploids investigated, shows differentiation in the direction of allotetraploidy. *S. acaule* and *S. tuberosum* appear to be related tetraploids. The question of their intraspecific or interspecific origin, however, remains unsolved.

The causes of incompatibility, including one-way incompatibility, are discussed with reference to the probable importance of cytoplasmic factors. Total and partial sterility within *Tuberarium* are classified.

1055. TEDIN, O.

633.491:581.143.32

Nyttillväxt hos potatis. (New growth in potatoes).

Sverig. Utsädesfören. Tidskr. 1944 : 54 : 316-24.

Six types of "new growth" of potato tubers resulting from long drought followed by abundant rainfall are defined and illustrated. Evidence is advanced to show that different clones (varieties) react differently to the conditions that may cause new growth and that, though the several types of the defect may occur in one and the same clone, their relative frequency is genetically determined and the diverse types of the defect do not occur indiscriminately in any particular variety of potato.

No certain correlation could be established between the earliness and frequency of new growth tubers.

The frequency of incidence of the defect in a variety depends upon some interaction between the genetic characteristics of the variety and the drought-rainfall distribution; the reaction of the same variety in different localities may therefore show results in direct contrast with each other.

1056. SOLODOVNIKOV, F. 633.491:581.165:581.02
 (The effect of the time of planting on the berry formation in potato).
 Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : No. 5-6 : 24-25.

Tubers of the potato varieties, Lorch and Smyslovskii, were planted at different times, from 30 May to 11 August, in the district of Alma-Ata. The latest plantings gave rise to the largest proportion of plants able to form berries, the largest quantity of berries per plant and the largest berries. Similar results in the following year were obtained when tubers of the above varieties, newly-gathered in the summer, were planted on various dates during the same summer. Even newly-gathered tubers of Early Rose, a variety never setting fruit in some parts of the country, were induced to form berries after the skins had been removed and the tubers artificially sprouted in special beds.

When successive generations of tubers were planted in summer instead of in spring, the vigour of berry formation increased.

Ensuring conditions which were congenial to the plants also encouraged the formation of berries. It is therefore argued that it is not genes but the coolness and short period of daylight, and other conditions during autumn, which make for berry and tuber formation, and enable the character of vigorous berry formation to be transmitted. Berries and tubers which have to be formed during a hot dry summer enjoy none of these advantages. I. Z.

1057. MONTALDO BUSTOS, A. 633.491:581.6:578.08
 Determinación de la calidad culinaria de las papas mediante su peso específico.
 (Determination of culinary quality of potatoes by specific weight).
 Agric. Tec. Chile 1944 : 4 : No. 1 : 78-87.

After a review of the literature on the subject, the various factors determining cooking quality are defined.

Sixty tubers were taken from each of nine varieties and their specific weight was determined in salt solutions of varying concentration. The tubers were then cooked by steaming and their quality was estimated by two independent judges. The varieties Industrie and Corahila were accorded the highest marks for quality.

A correlation of 0.905 was observed between specific weight and quality, and the method is thought to be of value in making selections for quality in breeding work.

1058. JOSEFSSON, A. 633.491-1.9
 Rostfläcksjuka hos potatis. (Spraing in potatoes).
 Sverig. Utsädesfören. Tidskr. 1945 : 55 : 34-42.

It is reported *inter alia* that for some years past experiments carried out on commercial varieties and new forms have shown that there are great varietal differences in resistance to spraing.

A classification is given of varieties, grouped as severely affected, not affected and only slightly affected and Gram and Weber's findings on varietal susceptibility are mentioned.

The proper choice of varieties is one of the ways of combating spraing.

1059. JOSEFSSON, A. 633.491-2.112-1.521.6:581.43
 Torkresistens och rotmassa hos några potatissorter. (Drought resistance and root mass in some varieties of potatoes).
 Sverig. Utsädesfören. Tidskr. 1944 : 54 : 325-31.

Potato varieties differ in drought resistance which is probably correlated with the degree of development of the root system. The difficulties of determining root weight in the potato are explained with suggestions as to how they may be overcome. The Swedish Seed Association's studies (here described) of varietal differences in root weight in potato trials have shown that Up-to-date and Sandnudel, which are highly drought resistant, have a much stronger root system than Ostbote (Eastern Messenger) and Stärkreich I (Starch Abundant) which are not so resistant.

Root mass alone is not however the only factor in proper root functioning. The length of the root filaments and other features are also important, as is also the foliage of the plant in determining drought resistance.

A study of the relation between root mass and yield suggests that the drought resistance of a variety is closely correlated with its root mass.

1060. BABB, M. F.,
KRAUS, J. E. and
STARR, G. H. 633.491-2.7-1.521.6(73)
Tolerance to psyllid yellows of potato varieties as reflected in yields.
Amer. Potato J. 1944 : 21 : 321-41.

A preliminary test of 56 commercial varieties and 182 seedling selections and South American varieties made in 1936 showed that none of them were immune from psyllid yellows. This test also indicated a positive association between early maturity and yielding ability, but the evidence was inconclusive.

A second varietal test in 1937 included 53 commercial varieties and 34 seedling selections. Cobbler and to a lesser degree Bliss Triumph were among the best varieties that can evidently be grown under conditions where spraying is impracticable for psyllid control. Despite the highly significant correlation between early maturity and high yields there were several important exceptions.

Tests in 1938 included 17 varieties representing the early, mid-season, late and very late crops. One half of the plots were sprayed and the remainder left unsprayed. The psyllid infestation was exceptionally heavy, and none of the varieties produced tubers of usable size in the unsprayed plots.

The work in 1939 was designed primarily to determine whether certain varieties sometimes escape the full effects of psyllid yellows by virtue of setting tubers at a time when they are not so seriously injured or by some degree of tolerance. Analysis of the results indicates that Cobbler and Bliss Triumph possess only a very low degree of true tolerance.

1061. FOLSOM, D. and
STEVENSON, F. J. 633.491-2.8-1.521.6
Potato resistance to leaf roll.
Phytopathology 1944 : 34 : 999-1000. (Abst.).

A considerable number of potato seedlings were tested in south-western Maine. A few showed apparent resistance to leaf roll. These were mostly derived from the cross Imperia x Earline. Several of these resistant seedlings were crossed with good commercial varieties. The resulting seedlings were usually more vigorous than the resistant parent, and only about 55% showed leaf roll infection.

1062. CLINCH, P. E. M.,
LOUGHNANE, J. B. and
McKAY, R. 633.491-2.8-1.521.6(41.5)
Notes on the leaf roll and mosaic diseases of potatoes in relation to seed potato production.
J. Dep. Agric. Éire 1944 : 41 : 263-76.

This paper includes references to the degree of susceptibility of various varieties to the leaf roll and mosaic diseases.

1063. McKAY, R. and
CLINCH, P. E. M. 633.491-2.8-1.521.6(41.5)
Leaf roll infection in the potato varieties Skerry Champion, Shamrock and Matador.
J. Dep. Agric. Éire 1944 : 41 : 200-08.

A high degree of resistance to leaf-roll was shown by Skerry Champion, 1% infection being observed. Both Shamrock and Matador showed an infection of 8%, and in both varieties the reduction in yield due to the disease was considerably greater than would be expected from the appearance of the foliage.

1064. JERMOLJEV, E. 633.491-2.8-1.521.6:578.08
Serologie bei Kartoffelzüchtung. (Serology in potato breeding).
Z. Pflanzenz. 1941 : 24 : 104-07.

The method of detecting the presence of a virus by serological methods is described for the benefit of potato breeders.

1065. BOSWELL, V. R. ET AL. 633.492:581.6:575(73)
Place and season effects on yields and starch content of 38 kinds of sweet-potatoes.
 Circ. U.S. Dep. Agric. 1944 : No. 714 : Pp. 15.

This circular reports the progress of a large, long-term co-operation scheme for the improvement and increased production of the sweet potato, better varieties being sought for the manufacture of starch and other products, for fodder and for human consumption.

Location and seasonal conditions at any one place may have marked effects on the percentage of starch as well as upon the total yields and the commercial grades of the tubers produced. Very marked and consistent differences among varieties were evident in starch content as well as in yield. Although the relative starch content among varieties varied somewhat from year to year and from place to place, varietal differences were highly significant with reference to interactions of variety with season and locality. Several seedlings and introductions were significantly superior to the varieties commonly grown in the United States in starch content, in yield of roots, and in amount of starch produced per acre. Although many varieties did better in some places than in others, as compared with other varieties, a few were outstandingly good in all tests. This demonstration of the possibility of obtaining superior varieties of very wide adaptability is of particular practical importance.

FIBRES 633.5

1066. *Hu, C. L. 633.51:575(51)
(A review of cotton research in China).
 Chinese J. Sci. Agric. 1943 : 1 : 147-58.

This paper gives a brief survey of researches on cotton in China during the last 25 years. It covers studies on (1) geographic distribution, (2) soil and fertilizers, (3) classification of cultivated varieties, (4) adaptability of Chinese and American varieties, (5) breeding, (6) genetics, (7) cultivation practices, (8) physiology, (9) quality of fibre, (10) diseases and pests, (11) farming implements, and (12) standardization of commercial fibre grading.

There are altogether five species known to be in cultivation: (1) *Gossypium arboreum* L., of which the variety Nanking, subdivisible into some 20 morphological types, annual and perennial, is most widely distributed, (2) *G. herbaceum* L., which is confined to Sinkiang and Kansu, (3) *G. hirsutum* L. which has been introduced from America and is common in North China, (4) *G. barbadense* L., comprising *G. lapideum* Jussac. and *G. peruvianum* Cav., both of south-west China, and (5) *G. purpurascens* Poir., which is cultivated in Kwangtung and Kwangsi.

Introduction of American varieties began in 1911 and the first adaptation study was conducted in 1918-19 followed later by acclimatization work. A second large-scale adaptation trial was made in 1933-37 with 31 newly introduced varieties. It was found that Stoneville No. 4 was best for the Huang-ho delta and Delfos No. 531 for the Yang-tze delta. Since the war further trials have been made in the south-western provinces. Many local and imported varieties have been tested and the best ones determined for each locality. Many American varieties are cultivated in China with success. In general the early-ripening varieties are suitable but the "big-bolled" varieties are not. The indigenous varieties are less adaptable; they generally do best in the particular localities in which they are found. The imported varieties are most important in the Huang-ho delta but not in the Yang-tze delta where local varieties are mostly grown because of the more varied natural and farming conditions. In the south-west, the cultivation of *G. barbadense*, Egyptain and Sea Island, is more promising.

Breeding work consists of the acclimatization of the imported varieties, pure line selection of local varieties and hybridization. Pure line selection since 1921 on both quality and yield has resulted in many improved varieties. The most important are (1) Improved Blue-stem Arboreum, (2) Improved Small White Flower, (3) Improved Kiangyin White Seed, (4) Shaogan Smooth-seed Long-staple, (5) Pei-wan Chinese, (6) Funghsien American No. 72, and (7) Chungnung New Delfos. Hybridization experiments have been made with Chinese, American and Indian varieties. More success was obtained, using the American varieties as female parent. Hybrid vigour was very marked but fertility was generally low. Important varieties obtained from hybridization are (1) Kwu's cotton (Kiangyin White Seed x Peking Long-staple), (2) Changfeng (Pei-wan x Shaogan Long-staple), (3) Multi-valve Ta-seh (Kiangyin White Seed x Five-valve Arboreum), (4) Resistant Long-staple (Indian Arboreum x Shaogan Long-staple), and (5) Arboreum-Delfos (American Arboreum x Delfos No. 531).

* An extended summary of this paper is on file at the Bureau.

Interesting discoveries have been made in the genetic studies. A yellow seedling mutant has been found and proved to be a simple Mendelian recessive lethal, linked with anthocyanin pigmentation. Another chlorophyll-deficient, yellow-green mutant has also been shown to be a simple Mendelian recessive. Hutchinson's allelomorphic series of anthocyanin pigments has been revised and a new parallel series of allelomorphs has been discovered. A new leaf-roll mutant has been shown to be a simple recessive and is linked with leaf-form with a cross-over value of 16.6%. Simple Mendelian inheritance has also been shown for leaf nectar-glands, corolla coloration, and corolla base coloration. Statistical studies have been made on the quantitative inheritance of the number of valves, weight of fruit, and yield.

H. C. Y.

1067. SILOW, R. A. 633.51:575.061.6:575.11(73)
Further data on the inheritance of lint color.
 J. Hered. 1945 : 36 : 62-64.

Genetic analysis of the range of variation in lint colour in the cultivated Old World cottons has been continued (cf. *Plant Breeding Abstracts*, Vol. XI, Abst. 997). A fourth main locus for colour, Lc_4 , has been identified in a khaki-linted strain of *G. arboreum* from Burma. Further multiple allelomorphism at the Lc_2 locus has been revealed. Considerable genotypic variability in minor lint colour due to the action of modifying genes has been found in *G. arboreum* race *indicum*.

1068. HUTCHINSON, J. B.,
 SILOW, R. A. and
 STEPHENS, S. G. 633.51:576.12:576.16:582
Evolution and domestication of cotton.
 Genetics 1945 : 30 : 9-10. (Abst.).

Genetical and cytological studies in *Gossypium* are sufficiently advanced to justify the preparation of a classification of the genus acceptable to the taxonomist. The diploid species fall into 3 major groups between which chromosome homology is low. Members related to two of these groups, one confined to the Old World and the other to the New, have entered into the ancestry of the amphidiploid American cottons. Within main cytological groups progressive differentiation accompanying geographical divergence has led to the establishment of populations characterized by co-ordinated genetic systems integrated into a balanced genotype, but so different in gene content as to give rise to extensive polygenic segregation in crosses between them. The products of recombinations are less balanced than the parental forms, many being weak or partially sterile; natural selection ensures their elimination. Populations whose integrity is maintained by such a genetic barrier rank as species, their distinction differing only in degree from that which exists between species which give highly sterile F_1 hybrids.

In the hairs on the seeds of wild diploid species, both Old World and American, secondary deposition of cellulose in spiral pattern on the inner surface of the wall proceeds until the central lumen is almost completely obliterated. Domestication, which occurred in the Old World, was dependent upon a reduction in amount of secondary thickening, so that upon drying the hairs collapse into flat convoluted ribbons which can be spun. There is reason to suppose that the New World amphidiploids acquired their lint quality from their Old World ancestor. The extensive cultivation of cotton and its comparatively recent spread into areas subject to frost have followed the development of the annual habit. This has occurred independently in all four cultivated species.

1069. DUNLAP, A. A. 633.51:581.02:581.145.2
Light, drought, and heat as factors in cotton boll-shedding.
 Phytopathology 1944 : 34 : p. 999. (Abst.).

Certain varieties of Upland cotton have shown considerable resistance to the effects of inadequate light. This reaction predisposes the plant to shed its immature bolls.

1070. NOVIKOV, V. A. 633.51:581.143.26.035.1
(The shedding of buds and capsules in the cotton plant, as influenced by the length of day).
 Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1944 : No. 1 : 29-37.

In order to discover the nature of the connexion between the length of day and the shedding of the buds and capsules which has been observed in cotton plants, the varieties, Pima (*Gossypium*

barbadense) and No. 8517 (*G. hirsutum*), were grown under two sets of conditions, viz. when the duration of daylight was long, and when it was short (10 hours). It was observed that, during 10-hour days, shedding of the buds and capsules was more frequent than during long days, and was the result of the reduced quantity of photosynthetic products formed during the shorter periods of daylight and available to the buds and capsules. As the days grew shorter and photosynthetic activity diminished, shedding increased, especially among the buds formed late in the season. I. Z.

1071. TER-AVANESJAN, D. V. 633.51:581.331.2:575(47)

Genetic diversity of gametes in the flower of cotton-plant.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1944 : 44 : 345-47.

The effects of pollination by a limited number of pollen grains were observed, in order to study the qualitative character of the male gametes. Up to 20 pollen grains were transferred to a stigma; the number of seeds formed was found to vary between 8 and 15 per boll. The varieties used were C-15 (Upland) and 35-1 (Egyptian). The F_1 plants so obtained consisted of plants inferior in all characters to the controls, and others excelling the control plants. No segregation was observed in the F_2 . The author ascribes the nature of the F_1 population to the qualitative heterogeneity of the male gametes of a single flower, and the lack of segregation in the F_2 to the effect of intrafloral hybridization, and is of the opinion that the so-called method of limited pollination may be applied in practical breeding, to improve a variety or to obtain a new variety from an existing variety in a short time.

1072. PEARSON, N. L. 633.51:581.6(73)

Neps in cotton yarns as related to variety, location, and season of growth.

Tech. Bull. U.S. Dep. Agric. 1944 : No. 878 : Pp. 18.

Variety, location, and season and their interactions affected significantly the number of neps in cotton yarn. The effect of variety was greatest. Varietal differences in neppiness may be largely accounted for by heritable differences in fibre length and in fibre weight per inch. Beta coefficients show that fibre length is first in importance, with weight per inch almost as important. The percentage of thin-walled fibres by itself accounts for little of the varietal differences in neppiness.

1073. 633.51:581.6:575(81)

A melhor fibra de algodão produzida no Brasil. (The best cotton fibre produced in Brazil).

Bol. Minist. Agric. Rio de J. 1943 : 32 : No. 9 : 144-45.

Reference is made to the cotton breeding work carried out at Pendência in the state of Paraná. The cotton Mocó Paraíba (M x P) has the best and longest lint of any yet found, many plants having fibres of over 50 mm., which are exceptionally silky and practically white in colour.

1074. WARE, J. O. and HARRELL, D. C. 633.51:581.6:575.1(73)

Inheritance of strength of lint in upland cotton.

J. Amer. Soc. Agron. 1944 : 36 : 976-87.

The F_1 , F_2 and F_3 , first generation back-crosses and second generation back-crosses were grown from a cross between the lines Florida Green Seed and Rowden. The Florida Green Seed parent had the higher lint strength index which was approximately 1 unit higher than in Rowden. The average measurements obtained indicate that inheritance of this quality is intermediate with a slight tendency to weak dominance; in repeated back-crossing the degree of strength is easily shifted in either direction. Lint strength in F_3 progenies from plants selected among several F_2 class intervals did not in any case show as much uniformity as either parent, but these F_3 plants tended to maintain the F_2 degree of strength. Some seasonal variation in lint strength was noted.

1075. 633.51-2.3-1.521.6:575(75.8)

Cotton varieties for South Georgia farms.

Mimeo. Pap. Ga Coastal Plain Exp. Sta. 1945 : No. 34 : p. 1. (Mimeographed).

The yields of the six highest yielding varieties in five years' tests are given. Deltapine 14, Marett's White Gold, Stoneville 2B, and Rhyne's Stoneville have produced good yields on land

not highly infested with wilt. Tifton Station 21 and Coker's 4 in 1 are more wilt resistant than these varieties. Two new varieties, Wannamaker's Stonwilt and Coker's 100 W.R., are mentioned as promising wilt resistant varieties.

1076. SCHLÖSSER, L.-A. 633.52:581.162.5:576.356.5:575.14
Über das Fertilverwerden autopolloider Leinsippen. (**The development of fertility in autopolyploid flax families**).
Züchter 1944 : 16 : 3-8.

A gradual increase in the fertility of colchicine-induced polyploids of flax and linseed varieties has been observed to occur after inbreeding. The thousand-seed weight in the polyploids is higher than the diploids but the number of seeds per capsule may either be greater or less than that of the parent diploids or may be the same.

1077. STOA, T. E. 633.52-2-1.521.6(78.4)
Varieties of flax and disease resistance.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1945 : 7 : No. 3 : 18-23.

Descriptions are given of the chief varieties, with reference to their plant characters, yielding capacity and reaction to the most common diseases. Varieties showing most resistance to rust are Renew, Victory, No. 5128, Walsh, Royal, Golden and Buda. Buda, the least resistant of these varieties to rust, shows most tolerance to pasmo.

1078. BRAGA, O. DE S. and KALCKMANN, R. E. 633.52.00.14(81)
Competição de variedades, de densidades e adubações de linha. (**Competition of varieties, spacing and manuring in flax**).
Bol. Soc. Brasil. Agron. Rio de J. 1944 : 7 : 7-20.

Two Brazilian varieties of fibre flax and an Argentine linseed variety Klein 11 were tested under different conditions of spacing and manuring. Of the two Brazilian varieties, Boa Vista was a pronouncedly textile variety, while Curitiba proved equal to it in stem yield and equal to Klein 11 in seed yield.

1079. SENGBUSCH, R. v. 633.522:576.312.332:575.113.3
Beitrag zum Geschlechtsproblem bei *Cannabis sativa*. (**Contribution to the problem of sex in *C. sativa***).
Z. indukt. Abstamm.- u. VererbLehre 1942 : 80 : 616-18.

In opposition to views expressed by other authorities, the author suggests that the monoecious hemp plants with a female habit are XX plants and not XY. Such plants give a 1 : 1 segregation of normal male and normal female plants when crossed with normal males. When crossed with normal females, almost all the offspring are female, while after inter-crossing the monoecious plants, monoecious plants and male plants with the female habit are produced. These observations and those of other investigators are held to support the conclusion that the monoecious plants with the female habit are homozygous for the X chromosome. The different grades of monoecism encountered are believed to be caused by the presence of an allelomorphic series of sex realizers.

1080. FRIEND, W. H. 633.524.1:575(76.4)
633.372:575(76.4)
Here comes a giant! Sunn hemp resists nematode, drouth and root rot; good fiber and green manure crop.
Sth Seedsman 1945 : 8 : No. 1 : 20, 43.

The giant type of *Crotalaria juncea* has given valuable results in the Lower Rio Grande Valley as a green manure crop and soil builder. It may give a yield of green manure as high as 20 tons per acre. It is more resistant to cotton root rot than any other legume tested at the Valley Experiment Station, and is practically immune to root knot nematode. In an emergency the crop might also be used as forage, as it is relished by cattle. Interest in Sunn hemp as a fibre crop (oakum) has led to experimental work in seed production.

1081. MEDVEDEVA, G. B. 633.524.35:581.162
(**On the embryology of *Hibiscus cannabinus***).
J. Bot. U.R.S.S. 1944 : 29 : 264-73.

No irregularities were observed in macrospore or microspore development in the various selections examined. Attempts to germinate the pollen in sugar solutions of varying concentrations,

with and without agar, were unsuccessful. The pollen germinated very vigorously however on the stigmas. The penetration of the pollen grains is described in detail; it was much more rapid on warmer than on cool, dull days. The rate of pollen tube growth was the same in both selfed and cross-pollinated plants. Fertilization, which took place invariably through the micropyle, was effected 4.5-5 hours after pollination. Double fertilization was observed and is described and figured. The early stages of development of the embryo and endosperm are also described.

1082. XAVIER, L. P. 633.526.5:575(81)
O caroá, história, cultura e distribuição geográfica. (**Caroá, its history, cultivation and geographical distribution**).
Minist. Agric., Dep. Nac. Prod. Veg., Div. Fom. Prod. Veg., Serv. Inform.
Agric. Rio de J. 1942 : Pp. 270.

A description is given of *Neoglaziovia variegata* Mez. (syn. *Bromelia variegata* Arr. Cam.), which produces fibres of the jute type and of its utilization and cultivation. Six varieties are distinguished. Among seedling progenies certain plants bearing 12 and even up to 14 leaves have been detected. Improved seedlings are multiplied vegetatively by means of rhizomes. The various respects in which improvement is looked for are enumerated.

SUGAR PLANTS 633.6

1083. PUERTAS, R. P. 633.61:581.6(72.91)
Que variedad de caña me conviene sembrar? (**What variety of sugar cane should I sow?**)
Bol. Ofic. Asoc. Tec. Azucar., Cuba 1944 : 3 : 162-66.

A brief account is given of the yield and quality of Cuban cane varieties.

1084. ALVAREZ, A. S. 633.61:581.6(82)
Purificación del jugo de las nuevas variedades de caña. (**Purification of the juice of the new varieties of cane**).
Bol. Estac. Agríc. Tucumán 1944 : No. 49 : Pp. 25.

Details are given of the behaviour of a number of the new Tucumán cane seedlings at various stages of the factory operations. The varieties are classed by comparison with the standard POJ 36. Those varieties are indicated which are superior to POJ 36 in degree of purity after purification, proportion of CaO to brix, rate of filtration, rate of decantation and volume of froth. Those that are markedly inferior are also indicated.

1085. 633.61-2-1.521.6(76.3)
Planning production of the Louisiana sugarcane crop.
Sug. Bull., N.O. 1944 : 23 : 44-46.

Reference is made to the susceptibilities of commercial varieties to red rot, root rot and chlorotic streak.

1086. CROSS, W. E. 633.61-2.451.2-1.521.6(82)
Nuevos datos sobre el "carbón" en las distintas variedades de caña de azúcar.
(**New data on smut in the different varieties of sugar cane**).
Bol. Estac. Agríc. Tucumán 1944 : No. 50 : Pp. 35.

Modifications necessary in the lists previously published on varietal susceptibility of sugar cane to smut are noted and a revised list presented. Details are given of the performance of the markedly susceptible varieties C.P. 29/320, Kavangire, P.O.J. 213, and the Tucumán varieties 407, 472, 1376 and 1400; the almost immune varieties Co. 290, P.O.J. 2725, P.O.J. 2727, P.O.J. 2961, and the Tucumán varieties 379, 1111, 1149, 1238, 1296, 1406, 1422, 1590, 2605, 2611, 2613, 2622, 2634, 2645, 2651, 2657, 2680, 2683, 2701, 2704 and 2705; and the slightly susceptible varieties Co. 270, Co. 281, Co. 284, Co. 289, C.P. 807, P.O.J. 1337, P.O.J. 1507, P.O.J. 2878, and the Tucumán varieties 630, 1139, 1199, 1220, 1231, and 1316. The mode of behaviour of the control variety P.O.J. 36 is briefly analysed.

A final section reviews the relevant foreign literature and contributes a note on the synonymy of the pathogen.

1087. PESCHEL, V. 633.63:575
Zuckerrübenzüchtung und Rübenenernte. (**Sugar beet breeding and beet harvesting**).
Mitt. Landw. 1944 : 59 : 839-40.

It is suggested that breeders should attempt the production of a sugar beet combining high sugar content with a shallow position in the ground, the latter habit being advantageous for harvesting.

1088. DEMING, G. W. 633.63:575.12:633.41(73)
Use of red garden beet in sugar-beet top crosses.
Proc. 3rd Amer. Soc. Sug. Beet Technol. 1942 (1943) : 336-41.

From the results obtained it appears that the red garden beet may be used as a satisfactory pollen parent in the top-cross method of determining the value of inbreds. Final judgment of the value of the proposed top-cross method, however, must rest on the results obtained by the combination of inbreds which the top-cross indicates as superior.

1089. DOXTATOR, C. W. and
SKUDERNA, A. W. 633.63:575.125:575(73)
Some crossing experiments with sugar beets.
Proc. 3rd Amer. Soc. Sug. Beet Technol. 1942 (1943): 325-35.

Experimental work has been carried out to study critically the effects of hybrid vigour in intervarietal crossing in sugar beet. This paper presents the results of tests obtained in the period 1940-41.

Complete, or nearly complete, crossing was obtained by the method of "bag-switching". Highly significant differences in yield of sugar per acre were observed in both 1940 and 1941 (a) between varieties, (b) between variety hybrids and (c) between varieties and variety hybrids. Average yield data obtained from 7 hybrids and their parent varieties tested in both 1940 and 1941 showed that 2 hybrids were significantly higher than both parents in pounds of sugar per acre. One hybrid did not differ significantly from either parent. The observed increase in yield of sugar per acre of the hybrids over the parents was obtained largely through increase in size of root, as evidenced by increased tonnage. Increases in percentage of sucrose, although relatively large, were not significant.

1090. BREWBAKER, H. E. and
BUSH, H. L. 633.63:575.42(73)
Generation studies of sugar-beet varieties.
Proc. 3rd Amer. Soc. Sug. Beet Technol. 1942 (1943) : 342-48.

The question has been investigated whether continued selection is necessary in order to maintain productiveness in a commercial variety.

1091. SKUDERNA, A. W. 633.63:576.356:581.04(73)
Use of colchicine in nutrient solution with sugar beets.
Proc. 3rd Amer. Soc. Sug. Beet Technol. 1942 (1943) : p. 321.

A preliminary investigation of the use of colchicine to induce chromosomal aberration is briefly described.

1092. LYNES, F. F. and
HARRIS, C. D. 633.63:576.356.5:581.04(73)
Polyploidy in sugar beets induced by the use of colchicine, ethyl mercury phosphate, and other chemicals.
Proc. 3rd Amer. Soc. Sug. Beet Technol. 1942 (1943) : 304-09.

In the treatment of seed with colchicine, ethyl mercury phosphate or other chemicals to produce polyploids, the mortality rate in the early seedling stage was found to be high, the root development of the seedlings being limited. Of the various methods investigated, the production of polyploid seed directly through the treatment of the inflorescence appears to be the most promising.

1093. PETO, F. H. and
HILL, K. W. 633.63:576.356.5:581.04:575(73)
Colchicine treatments of sugar beets and the yielding capacity of the resulting polyploids.
Proc. 3rd Amer. Soc. Sug. Beet Technol. 1942 (1943) : 287-95.

Tetraploids of a number of varieties have been produced by means of colchicine treatments.

Triploids have been produced in abundance through pollination of diploid plants with pollen from tetraploids.

Excellent seed yields of highly germinable seed were obtained from the field-grown tetraploids. In seed size the tetraploids exceeded the diploids but in number of seeds per plant the reverse was observed. In two out of three environments, certain triploids and tetraploids exceeded diploids in root weight and sugar per beet. The tetraploid plants were morphologically distinguishable from diploid at all stages of development. The most striking differences were in (a) seed size, (b) petiole length, (c) lamina size and texture, (d) stomatal size, (e) seed-stalk length and diameter, and (f) pollen size.

Heterosis combined with polyploidy appears to have economic possibilities, the performance of the hybrid tetraploid Sandomiersko x Buszczynski being promising in comparison with other polyploids included in a yield test at Vancouver, British Columbia, in 1941.

Triploids and tetraploids were usually much more uniform than diploids from which they were derived. The agronomic qualities of both triploids and tetraploids in the limited tests to date are considered to be sufficiently promising to justify increased emphasis on the new method of breeding.

1094. SKUDERNA, A. W.,
DOXTATOR, C. W.,
SWIFT, E.,
BOWMAN, R. L. and
DESCHAMPS, A. 633.63:581.02(73)
A study of varietal adaptation with sugar beets—1937 to 1941, inclusive.

Proc. 3rd Amer. Soc. Sug. Beet Technol. 1942 (1943) : 349–56.

From comparative tests conducted over the 5-year period, 1937–41 inclusive, it was observed that a number of commercial varieties gave different tonnage yield and sucrose percentage in different areas. Certain domestic varieties were found to be significantly high in yield in several of the areas under test in 1941. It is emphasized that, in view of the results obtained during this 5-year period, new varieties should be tested in all areas where possible commercial production is planned, and that commercial varieties should be made from increase of elite stocks originally selected in the area in question.

1095. STOUT, M. and
OWEN, F. V. 633.63:581.143.26.03(73)
Vernalization of sugar-beet seed.

Proc. 3rd Amer. Soc. Sug. Beet Technol. 1942 (1943) : 386–95.

Exposure of slightly germinating seed to temperatures between 33 and 40° F. hastened the reproductive development of plants when the seed was planted in an environment favourable to the combination of "photothermal" induction, with cool temperatures and long photoperiods. Success of treatments was found to depend upon securing a visible amount of sprouting before or during cold storage and upon a healthy condition of the sprouts at the time of planting; methods of reducing injury during storage are described. While vernalization is a practical means of hastening reproduction under controlled greenhouse conditions, it is probably impractical as a means of increasing bolting in seed fields.

1096. LYNES, F. F. and
CORMANY, C. E. 633.63:581.162.3:578.08(73)
Refinements in the technique of isolating by bags and cages.

Proc. 3rd Amer. Soc. Sug. Beet Technol. 1942 (1943) : 399–405.

The paper deals with the presence of foreign pollen in bagging work and its control; the use of paper bags for hybridization work; and the use of large paper bags and of cloth in individual and group isolation.

1097. DAHLBERG, H. W. 633.63:581.192:575.42(73)
Non-sugar relationships in breeding high-purity beets.

Proc. 3rd Amer. Soc. Sug. Beet Technol. 1942 (1943) : 322–25.

As a result of 10 years' work, less emphasis is now given to the percentage of noxious nitrogen in carrying out selection than at the start. It appears that more progress can be made by studying

the ash content by electrical resistance, and checking by means of determinations of "true purity". The effect of leaf-spot on purity has been noticeable, both percentage sugar and purity being higher in its absence.

1098. LEPA, P.

633.63-1.531

(The summer sowing of sugar beet in the Uzbek S.S.R.).

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : No. 1 : 20-21.

If beet in Uzbekistan be sown in spring, initial growth is abundant in leaves, especially if irrigation has been employed, but the succeeding period of drought causes some of the leaves to be shed, and if, later in the season, secondary growth should ensue, the sugar of the roots is drawn upon and its quantity thereby diminished.

It is therefore recommended by Lysenko that beet seed be sown at the end of June or early in July as a catch-crop after cereals. The results in Uzbekistan have proved successful; the foliage remained green and crisp; and the roots in storage retained more sugar than did the spring-sown beets. Though the yields of seed from transplanted roots grown from seed which had been sown in summer were no larger than from such roots grown from a spring sowing, the seed itself was heavier. Furthermore, when the roots of summer-sown beet were transplanted even as late as 5 May, the yield of seed was normal; but the roots of spring-sown beet when transplanted at so late a period yielded no seed at all.

I. Z.

1099. GASKILL, J. O.

633.63-1.543:575.42(73)

Selection of sugar beets for size of root under wide and normal spacings.

Proc. 3rd Amer. Soc. Sug. Beet Technol. 1942 (1943) : 372-77.

The following tentative conclusions were obtained from the 1 year's investigation of the effect of spacing in selection: (1) improvement in root-yielding ability can be obtained in certain varieties by selection of large roots under wide spacing conditions, with subsequent mass increase; (2) there is no difference between the effectiveness of selection of large roots under wide spacing and under normal spacing; (3) genetic lack of vigour is evidently strongly associated with the size of small roots under wide spacing, while such a relationship is not shown for small roots under normal spacing.

The results obtained appear to substantiate previously published suggestions that the wide-spacing method may be used with advantage in connexion with very small seed lots, both in preliminary evaluation of breeding strains and mother-plant selection.

1100. ABEGG, F. A.

633.63-1.557:576.356.5(73)

Evaluation of polyploid strains derived from curly-top resistant and leafspot-resistant sugar-beet varieties.

Proc. 3rd Amer. Soc. Sug. Beet Technol. 1942 (1943) : 309-20.

The results are reported of 2 years' comparative yield tests with tetraploid strains derived from the diploid varieties, U.S. 22, U.S. 23 and U.S. 215.

The average $4n$ yield showed a definite trend towards lower root weight in comparison with that of the parental diploids. Such a reduction in yield was even more marked with $4n$ strains derived from a highly self-fertile inbred diploid stock which traces back to pedigree No. 1167. So far, 3 tetraploid strains have exceeded the root yield of their related diploid stocks by approximately 15%. These $4n$ strains, however, were 0.7-1.5% lower in sucrose percentage. The average sucrose yield of this group of vigorous tetraploids was therefore estimated to be nearly the same as that of the diploid.

The chief morphological differences observed between tetraploids and diploids were as follows: the leaves of some $4n$ strains were larger and broader; in several $4n$ strains, leaf stomata were larger than those of the comparable diploids; and the pollen size of the tetraploid plants was greater.

From limited bagging trials it was found that $4n$ plants derived from the economic varieties were not markedly altered in respect of the degree of self-fertility. Tetraploidy in several inbred strains, related to pedigree No. 1167, resulted in a reduction of self-fertility.

1101. COONS, G. H. ET AL.

633.63-2.484-1.521.6:575.125

Report on 1941 tests of U.S. 200 x 215, U.S. 215 x 216, and other varieties arising in leafspot-resistance breeding investigations of the U.S. Department of Agriculture.

Proc. 3rd Amer. Soc. Sug. Beet Technol. 1942 (1943) : 356-64.

The variety Synthetic Check, obtained by pooling equal quantities of 9 European varieties and

using this mixture to produce a seed crop, has again been found to be superior to many European varieties. The general superiority of U.S. 200 x 215 to Synthetic Check is also shown. Several instances have been obtained of superiority of a new variety in both sucrose percentage and root yield over (1) U.S. 200 x 215, (2) Synthetic Check, and (3) the local variety. The following combinations show particular promise, subject to the results of further tests: U.S. 216 x 215 and Cesena x 215, U.S. 216 and a high yielding, moderately resistant inbred 8-266-0, U.S. 215 x a selection 8-419-0 with high sucrose percentage and resistance to leaf-spot, and mixture of U.S. 200, U.S. 215 and U.S. 216 sown in the field in equal proportions.

1102. BUSH, H. L. 633.63.00.14-1.421(73)
Further studies in newer designs for large-scale variety tests.
 Proc. 3rd Amer. Soc. Sug. Beet Technol. 1942 (1943) : 365-72.

Quasi-factorial designs in variety testing are recommended as giving greater precision than the random complete block method under the varied conditions of the Great Western territory.

1103. GRANER, E. A. 633.682:576.356.5:577.16(81)
 Uma forma tetraplóide de mandioca Vassourinha de provável valor hortícola.
(A tetraploid form of Vassourinha cassava of probable horticultural value).
 Rev. Agric. Piracicaba 1944 : 19 : 380-91.

Two tetraploid forms of the cassava variety Vassourinha Paulista have been obtained by colchicine treatment. They grow more slowly than the diploid in their first season of growth and the ratio of root to shoot production is less; the plants are much smaller, however, which is an advantage for horticultural purposes, as it permits of a closer spacing. There is considerable demand at present for a garden form, owing to the high vitamin B content of cassava. One of the two tetraploids was much smaller than the other.

STIMULANTS 633.7

1104. LIMA, A. R.,
 BRIEGER, F. G. and
 SANTOS, S. R. DOS. 633.71:575(81)
 Seleção de fumo "Amarelinho" para estufa. **(Selection of the flue-cured tobacco Amarelinho).**
 Bragantia, São Paulo 1944 : 4 : 523-40.

The tobaccos of the type Amarelinho have been grown in Rio Grande do Sul for many years and are thought to have originated from crosses between local varieties and some imported tobacco, possibly of the Maryland type. Systematic selection work has been carried out with them since 1933. Several of the plants when selfed proved to be heterozygous and some produced segregates superior in yield and leaf size. This is thought to be a more practical method of improvement than the more complicated method of hybridization.

1105. GOODSPEED, T. H. 633.71:575.127.2:575.129:582(79.4)
***Nicotiana Arentsii* - a new, naturally occurring amphidiploid, species.**
 Proc. Calif. Acad. Sci. 1944 : 25 : 291-306.

N. Arentsii ($n = 24$) is a new species from south-eastern Peru. The morphology, cytology and geographical distribution of this species and two other species, *N. undulata* ($n = 12$) and *N. wiganoides* ($n = 12$) are described. The evidence obtained from these studies and from the cytological investigation of the F_1 hybrids of crosses of *N. Arentsii* with *N. undulata* and *N. wiganoides* indicates that *N. Arentsii* is an amphidiploid which has arisen as a result of hybridization between *N. undulata* and *N. wiganoides*.

1106. HEGGESTAD, H. E. 633.71:581.032:575.113.4
Varietal variation and inheritance studies on natural water-soaking in tobacco.
 Phytopathology 1944 : 34 : p. 1002. (Abst.).

Natural water-soaking in several foreign, domestic and local varieties of tobacco was compared under conditions of moist-chamber and outdoor seed beds. The inheritance of natural water-soaking appears to be governed by multiple factors. Relative susceptibility to wild-fire disease was correlated with relative susceptibility to water-soaking. Varietal variation in water-soaking was also found in tomatoes, oats and maize.

1107. MOTHES, K. and HIEKE, K. 633.71:581.165.71:581.192:635.64
Die Tabakwurzel als Bildungsstätte des Nikotins. (**The tobacco root as the region of nicotine formation**).
Naturwissenschaften 1943 : 31 : 17-18.

Tomato scions when grafted on to tobacco stocks are found to contain nicotine in their leaves, while the scions of the reciprocal graft become nicotine-free. Similar results obtain from three-membered grafts. These observations, together with the discovery that nicotine is present in the xylem sap, are believed to demonstrate that nicotine synthesis occurs in the root (Cf *Plant Breeding Abstracts*, Vol. XIII, Abst. 1280).

1108. CLAYTON, E. E. 633.71-2.411.4-1.521.6:575.127.2(73)
Resistance of tobacco to blue mold (*Peronospora tabacina*).
J. Agric. Res. 1945 : 70 : 79-87.

Tests with over a thousand collections of *Nicotiana Tabacum* showed that none possessed resistance to *Peronospora tabacina* Adam sufficient to provide the basis of a breeding programme. Other species of *Nicotiana* are evidently highly resistant to blue mould but the manifestation of resistance depends upon a number of factors, the most important single factor being the age of the plant. The age at which greenhouse grown plants of different species become highly resistant varied considerably, from 6 or 7 weeks in *N. longiflora* and *N. plumbaginifolia* to 2 weeks in *N. Goodspeedii*; in the case of *N. Debneyi*, *N. rotundifolia*, *N. maritima* and *N. megalosiphon* the age was 3-4 weeks. *N. exigua* was immune at all stages of growth. These results compare closely with those obtained under the most severe out-of-door conditions. Under field conditions no infection was observed in any of these 8 species. Successful crosses have been made between *N. Tabacum* and *N. Debneyi*, *N. megalosiphon*, *N. longiflora* and *N. plumbaginifolia*.

1109. 633.73:581.162(66.99)
Miscelánea agrícola. 19. (**Agricultural miscellany. 19.**)
Bol. Agric. Territorios Españoles del Golfo de Guinea 1943 : No. 7 : 83-84.

This note deals with the causes underlying flowering induction in coffee and gives a short description of varietal differences in respect of this character observed at Santa Isabel.

OIL PLANTS 633.8

1110. ANDERSSON, G. and BJÖRKLUND, C. M. 633.853.49-1.556:581.6
Skördetidsförsök i höstraps och vitsenap sommaren 1944. (**Experiments on the time of harvesting of winter rape and white mustard, summer 1944.**)
Sverig. Utsädesfören. Tidskr. 1945 : 55 : 20-25.

Experiments are recorded on the effect of the time of harvesting upon the yield of seed and its chemical composition.

RUBBER PLANTS 633.91

1111. CAMARGO, F. 633.912:575(81)
Uma nova planta Brasileira produtora de borracha. (**A new Brazilian plant producing rubber**).
Bol. Minist. Agric. Rio de J. 1943 : 32 : No. 4 : 45-55.

Rubber clones from the east suffer excessively from *Dothidella Ulei* when grown in Brazil. Certain clones from Acre and from Belém have proved resistant though their latex yield is low. They may serve as useful parents in hybridization. Latex has been obtained from various local species of *Sapium* and from it rubber of the finest quality has been produced. Species of this genus are exceedingly abundant in the Amazon basin and growers are advised to plant them until suitable clones of *Hevea* become available.

1112. ROLLINS, R. C. 633.913:575.127.2:576.312.35
Some known and probable levels of reciprocal introgression between guayule (*Parthenium argentatum*) and mariola (*P. incanum*).
 Genetics 1945 : 30 : 18-19. (Abst.).

One of the principal sources of wide variation in guayule under natural conditions is the inter-specific hybridization which occurs between it and mariola. The reverse is probably true to a lesser extent, but less is known concerning plants of hybrid origin among wild populations where mariola predominates. The extensive polyploid series found in each species and the crossability of plants having different chromosome numbers complicate the attempt to analyse the hybrids between the 2 species. Further complication is added by the fact that both reduced and non-reduced egg-cells are functional in each species. Among the hybrids a very complex series is found representing nearly a complete set of transitional steps from one species to another.

1113. 633.913:576.356.5:581.04
 Schutz und Meliorierung der Wälder. (Protection and improvement of forests).
 Intersylva 1943 : 3 : 553-54.

A reference is made to the fact that the Kaiser Wilhelm Institute for Breeding Research, Münchenberg, is investigating the rubber plant *Taraxacum Kok-saghyz*. Tetraploid races have been obtained by colchicine treatment.

1114. WHITTENBERGER, R. T. 633.913:578.65:578.6
Oil blue NA as a stain for rubber in sectioned or ground plant tissues.
 Stain Technol. 1944 : 19 : 93-98.

Oil blue-NA (Calco), a stain which colours rubber bright blue, has been used with success in studying the distribution of rubber in *Parthenium argentatum*, *Taraxacum Kok-saghyz* and other species, in both untreated and milled tissues. A microscopic technique is also described for the determination of the relative proportion of dispersed and coagulated latex in unstained tissues.

1115. POWERS, L. and ROLLINS, R. C. 633.913:581.162:581.163:581.162.5
Reproduction and pollination studies on guayule, *Parthenium argentatum* Gray and *P. incanum* H.B.K.
 J. Amer. Soc. Agron. 1945 : 37 : 96-112.

The data indicate that some plants of guayule, *P. argentatum*, and mariola, *P. incanum*, are characterized by a high degree of facultative apomixis, and that apomictic plants are also pseudogamous. Collections of guayule also occur which are almost if not completely sexual. In all the highly sexual forms observed so far $2n = 36$ or more. No predominantly normal sexual plants of guayule have been found among the polyploid groups with $54 \pm$, $72 \pm$ and $108 \pm$ chromosomes. Predominantly normal sexual plants of mariola occurred infrequently among the collections. The evidence suggests that some plants of the polyploid groups of guayule have been produced by reduced and unreduced pseudogamy, and by fertilization of reduced and unreduced gametes. In mariola unreduced pseudogamy and the fertilization of reduced and unreduced gametes have been observed. The question of incompatibility in guayule is discussed.

1116. GILJAROV, M. S. and PRAVDIN, F. N. 633.913:581.162.3
(The ecology of pollination in kok-saghyz).
 Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1943 : No. 6 : 243-60.

Pollination in *Taraxacum Kok-saghyz* Rod. is effected almost entirely by insects. The hive bee and *Halictus* species bring about most of the pollination, operating when the temperature is at or above 17° C. Below this temperature various species of flies bring about some pollination. Approximately 1000 hive bees are necessary to pollinate 1 hectare of kok-saghyz. Their radius of operation is about 3 km.

1117. PRESLEY, J. T. 633.913-2.484-1.521.6(73)
Observations on *Phymatotrichum* root rot of guayule.
 Plant Dis. Reporter 1944 : 28 : 998-1000. (Mimeographed).

Significant differences between certain varieties in their response to *Phymatotrichum* root rot were found on both irrigated and dry land plantings. Variety 109 was significantly the most susceptible to root rot.

1118. MOWRY, H. and
TOY, L. R. Revised by
WOLFE, H. S. 634(75.9)
Miscellaneous tropical and sub-tropical Florida fruits.
Bull. Agric. Ext. Serv. Fla 1941 : No. 109 : (Revision of Bull. 85) : Pp. 94.
Descriptions are given of a considerable number of miscellaneous fruits which have shown their adaptability to the climatic and soil conditions of Florida, but which are not yet widely known.
1119. DRAIN, B. D. 634:575(73)
635:575(73)
Breeding plants for adaptation, freedom from insect injury, and disease resistance.
Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 225-28.
The article briefly discusses the particular problem of breeding horticultural crops in the Southern U.S.A.
1120. STARK, A. L. 634:581.162.3(79.2)
Fruit pollination—a problem in Utah.
Fm Home Sci. Utah 1944 : 5 : No. 4 : 5-6.
The use of bees in pollination and of pollinating varieties are discussed as essentials for a satisfactory set of fruit.
1121. SHAW, J. K. 634.11:575.247(74.4)
Bud sports of McIntosh.
News Lett. Ill. St. Hort. Soc. 1944 : No. 8 : p. 4.
A number of strains or bud sports each propagated from a McIntosh apple tree are reported by J. K. Shaw, in Massachusetts "Fruit Notes". Seven of these strains have fruited, and small differences in colour are evident. An experiment is in progress which will show whether or not there are differences other than fruit colour among the seven strains.
1122. TUKEY, H. B. and
BRASE, K. D. 634.11:581.165.71
Differences in congeniality of two sources of McIntosh apple budwood propagated on rootstock USDA 227.
Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 190-94.
Differences in compatibility were observed in budwood from two trees, 7-1 and 1-35, of the variety McIntosh, when budded on rootstocks of USDA 227. The possible causes of this differing congeniality are discussed, with emphasis on the need of a more critical study of variations in horticultural varieties of deciduous fruits which are now considered to be fixed clones.
1123. HILDEBRAND, E. M. 634.23:581.143.32:632.8:575.11
The cherry virus complex in New York.
Phytopathology 1944 : 34 : p. 1003. (Abst.).
Several non-lethal abnormalities of a genetic or virus nature have been observed in cherries in New York State.
1124. LESLEY, J. W. 634.25(79.4)
New peach varieties for a subtropical climate.
Calif. Citrog. 1944 : 29 : p. 138.
A brief account is given of the following peach varieties which are recommended to growers in subtropical America: Robin, Redbird, Weldon, Hermosa, Sunglow and Fontana.
1125. WEINBERGER, J. H. 634.25:575
Characteristics of the progeny of certain peach varieties.
Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 233-38.
This paper reports the data obtained from large populations of hybrids and selfed seedlings. Information on some of the genetic characters of a number of varieties was obtained. Halehaven, South Haven, Fair Beauty and Sunbeam were among the varieties found to be heterozygous for the dominant character of non-showy blossom type; Muir was found to be homozygous for the same character. Round fruits "predominated" over oval. Cumberland, Belle, Hiley and Early Hiley, all white varieties, are heterozygous for the dominant character of white flesh; Early Wheeler and Early Rose are homozygous whites.

Many early ripening seedlings and varieties that are phenotypic clingstones are probably genotypic freestones. Fireglow, Dixigold, Halehaven and a number of other varieties carry strong factors for freestone; Hiley, Early Hiley, Early Elberta, Fair Beauty and some other freestone and semi-freestone varieties carry factors for clingstone as well as for freestone.

Other characters studied were time of blossoming, bud set, time of fruit ripening, fruit size, pubescence, red skin colour, firmness and edible quality of fruit.

All but a few of the more promising seedlings obtained have been derived from the variety J. H. Hale.

1126. BLAKE, M. A. 634.25:575(74.9)
Some methods used in breeding peaches in New Jersey.
 Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 220-24.

This article briefly describes the development of peach breeding in New Jersey and the methods now in use.

1127. LAMMERTS, W. E. 634.25:575.11
 634.25:575.11.061.6
The breeding of ornamental edible peaches for mild climates. I.
Inheritance of tree and flower characters.
 Amer. J. Bot. 1945 : 32 : 53-61.

Genetical studies have been made with the peach varieties Early Double Pink, Early Double Red, Peppermint Stick, Chinese Dwarf Evergreen, Babcock, Rio Oso Gem and Socala.

The recessive gene *dw* determines dwarf habit, while the duplicate recessive factors *bu₁* and *bu₂* determine bushiness. Both evergreen habit and low chilling requirement are polymerically determined characters depending on the interaction of several genes. An incompletely dominant factor *L* determines large flower size in plants homozygous for gene *sh* (showy flowers); its effect on non-showy flowers was not investigated. Flower colour depends on the interaction of several genes. Coloured flowers are produced only on plants carrying at least one *W* factor, the *ww* genotype bearing white flowers. Dark pink flowers are determined by the genotypes *PPRR*, *PpRR* and *PpRr*, light pink by *ppRR* and *ppRr*, and red by *PPrr*, *Pprr* and *pprr*. A variegation factor *w*^v was discovered, and is probably allelomorphous to *w*. Petal number is determined by the interaction of three genes, one (*d₁*) completely recessive, and two (*dm₁* and *dm₂*) incompletely recessive. Single flowers are produced on plants of genetical constitution *D₁d₁Dm₁dm₁Dm₂dm₂*, *D₁d₁dm₁dm₁Dm₂dm₂*, *D₁d₁Dm₁dm₁dm₂dm₂*, or *D₁d₁dm₁dm₁dm₂dm₂*; the genotypes *d₁d₁Dm₁dm₁Dm₂dm₂*, *d₁d₁Dm₁dm₁dm₂dm₂*, and *d₁d₁dm₁dm₁Dm₂dm₂* give rise to double flowers with 10-18 petals; while the genotype *d₁d₁dm₁dm₂dm₂dm₂* gives rise to double flowers with 15-24 petals.

1128. RIGGOTTI, R. 634.25:575.127.2:581.165.711(45)
 Un nuovo portainnesto del pesco? *Prunus persica* x *Prunus davidiana*. (A
new peach stock? *P. persica* x *P. davidiana*.
 Ital. Agric. 1942 : 21 : 664-67.

P. Davidiana, which is early flowering and resistant to the low temperatures and snows of spring, failed as a direct stock for peach buddings. It was then decided to try whether peach grafts could be grown on *P. persica* x *P. Davidiana*. In 1937 under laboratory conditions the peach variety Moscatella bianca (White Muscatel) was pollinated with pollen from cut branches of *P. Davidiana* kept under suitable conditions till the peach flowers were receptive.

Two plants from this cross set abundant flowers in the first year and 300 fruits with perfectly formed seeds in the third year. These fruits of the free stone type ripened early in August, had tender, white flesh, 1 cm. thick, while the flavour had a bitter and astringent tang and a slight aroma of musk.

Though *P. Davidiana* exhibits no affinity when grafted with the peach, it has considerable genetic affinity with that fruit, and the hybrid has several desirable features which should make systematic selection for the ideal peach stock characters worth while.

1129. LESLEY, J. W. 634.25:581.143.26.036
Peach breeding in relation to winter chilling requirements.
 Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 243-50.

Peach varieties show considerable variation in the amount of chilling necessary for the natural breaking of dormancy in regions of mild winter climate. Chilling requirement is controlled by

multiple gene interaction. The present paper deals with experiments on the breeding of peaches that require relatively little winter chilling. Hybridization as a rule produced a variety of phenotypes differing in chilling requirement. About three-fifths of the combined F_1 families were within the parental range of chilling requirement, one-fifth had less and one-fifth had greater chilling requirement than either parent.

Selfing for 3 to 4 generations has produced several vigorous lines showing an increase in uniformity.

1130. SCOTT, D. H. and WEINBERGER, J. H. 634.25:581.331.2:581.162.5
Inheritance of pollen sterility in some peach varieties.
 Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 229-32.

A classification of a number of peach varieties has been made on the basis of the condition of their pollen. The classes are as follows: varieties that are homozygous dominants for fertility, heterozygous varieties with fertile pollen, and homozygous recessives for pollen sterility.

1131. BLAKE, M. A. and STEELMAN, C. H. (jun.) 634.25-2.111(73)
Preliminary investigations of the cold resistance of peach fruit buds at the pink bud stages of development.
 Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 37-41.

A study was made of the hardiness of fruit buds at pink bud stages of development in a number of peach varieties. Early Heath, in particular, showed a relative tenderness of buds.

1132. FROST, H. B. and KRUG, C. A. 634.3:575.255:576.356.5
 Quimeras periclinais diplóides-tetraplóides súrgidas em forma de variações somáticas em *Citrus*. (**Diploid-tetraploid periclinal chimaeras arising as somatic variations in *Citrus***).
 Bragantia, São Paulo 1944 : 4 : 449-74.

This is a slightly amplified Portuguese version of the article reviewed in *Plant Breeding Abstracts*, Vol. XIII, Abst. 594.

1133. KRUG, C. A. 634.3:576.312.35
 634.3:582
 Observações citológicas em *Citrus*. IV. Números de cromossômios na subfamília Aurantioideae com referência especial ao gênero *Citrus*. (**Cytological observations in *Citrus*. IV. Chromosome number in the subfamily Aurantioideae with special reference to the genus *Citrus***).
 Bragantia, São Paulo 1944 : 4 : 413-28.

The somatic chromosome numbers of a number of hitherto undetermined species are reported in the present paper, together with a tabulation of all the chromosome numbers reported in the literature. The results show clearly that the basic number for the subfamily is $x = 9$ and the vast majority of the species are diploid, with $2n = 18$. However, over 50 triploids or quasi-triploids have been found in the genus *Citrus*, only two of them being of any economic value (cf. Abst. 1136). Tetraploids have been found in four genera, *Citrus*, *Fortunella*, *Poncirus* and *Triphasia*, and one interspecific hybrid. Apparently only two higher polyploids have been encountered, a pentaploid orange hybrid (Bacchi, unpublished) and the hexaploid lemon reported by Lapin (cf. *Plant Breeding Abstracts*, Vol. IX, Abst. 1182). Certain aneuploid forms have also been described.

In H. B. Frost's appendix certain corrections to the systematics of the genus *Citrus*, based on unpublished information by Swingle, are cited.

1134. KRUG, C. A. and BACCHI, O. 634.3:576.356.5:581.49
 Observações citológicas em *Citrus*. V. Poliploidia em relação à densidade e ao tamanho dos estomas em *Citrus* e outros gêneros das Aurantioideae. (**Cytological observations in *Citrus*. V. Polyploidy in relation to the density and size of the stomata in *Citrus* and other genera of the Aurantioideae**).
 Bragantia, São Paulo 1944 : 4 : 429-47.

Wide differences in stomatal density have been observed between different *Citrus* varieties, and

a comparison of these with the chromosome numbers shows that they are only in rare instances conditioned by polyploidy, as for instance in the triploid Tahiti and Bearss limes. However, significant differences in stomatal area were observed between diploid, triploid and tetraploid species and between diploid and tetraploid individuals of the same species; also between triploids and the diploid and tetraploid representatives of their respective parents. Variations were observed within the different groups, but the differences between the groups were sufficient to enable reliable distinctions to be made between triploid and tetraploid individuals in the same progeny.

1135. BACCHI, O. 634.3:581.481:576.37
Observações citológicas em citrus. III. Megasporogênese, fertilização e poliembryonia. (**Cytological observations in citrus. III. Megasporogenesis, fertilization, and polyembryony**).
Bragantia, São Paulo 1944 : 4 : 405-12.

The course of megasporogenesis, fertilization and endosperm formation in *Citrus* spp. is described. Three types of polyembryony are mentioned: (a) nucellar buds, (b) cleavage polyembryony, and (c) polyembryony arising from the formation and fertilization of more than one embryo-sac per ovule (cf. *Plant Breeding Abstracts*, Vol. XIV, Abst. 978).

1136. KRUG, C. A. and BACCHI, O. 634.337:576.356.5
Observações citológicas em Citrus. II. Variedades triplóides. (**Cytological observations in Citrus. II. Triploid varieties**).
Bragantia, São Paulo 1944 : 4 : 393-403.

In continuance of previous work (cf. *Plant Breeding Abstracts*, Vol. XI, Abst. 793), it is confirmed that the Tahiti lime is triploid, with $2n = 33$. In this form both microsporocytes and megasporocytes degenerate at a very early stage, before meiosis has occurred, and its sterility is therefore not thought to be caused by meiotic irregularities. A few good pollen grains are formed and occasional gametic seedlings have been obtained. A study was made of 54 fruits arising by open pollination; they contained a total of 8 seeds, none of which germinated. From an examination of a further 33 fruits 11 more seeds were obtained, of which 6 germinated; 3 seedlings were obtained, having chromosome numbers of 19, 20 and 21 respectively. From this it was concluded that only those megaspores with a chromosome number approximating to 9 had functioned. The three seedlings, none of which was nucellar in origin, differed in habit and foliage characters. A study of the characters of the Bearss seedless lime lent support to the suggestion that it is a nucellar seedling of the Tahiti lime, and chromosome counts showed it also to be triploid, with $2n = 27$. The behaviour of its sporocytes also resembled that of the Tahiti lime. The superiority of these two limes over the common diploid limes suggests that triploidy may be an important factor in citrus breeding in the future.

1137. LYNCH, S. J. 634.343:575(73)
The Dade white-sapote.
Pr. Bull. Fla Agric. Exp. Sta. 1943:No. 581:Pp. 4; also Calif. Cultiv. 1943:90:p. 227.

A new variety of white sapote is reported. It originated from the seed SES 888 obtained from a selected seedling in Dade County, Florida, and has been named Dade. The Dade is a low-headed tree of moderate vigour, with a single trunk. The fruits mature during June and July, and have shown so far no sign of bitterness. The uniformity of the fruit makes them very suitable for packing.

1138. WEBBER, H. J. 634.42:577.16
The vitamin C content of guavas.
Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 87-94.

The vitamin C content of 19 varieties of guava fruits was determined. The data obtained indicate that clonal varieties differ considerably in their content of vitamin C. The relations of the vitamin C content with flesh colour, degree of acidity, season of ripening, period of picking and stage of maturity, were also studied.

1139. YOUNG, T. W. 634.441:581:162.5(75.9)
Investigations on the unfruitfulness of the Haden mango (*Mangifera indica*, Linn.) in Florida.

Abstr. Thes. Cornell Univ. 1942 (1943) : 483-87.

Unfruitfulness in the Haden variety of mango appears to be due to degeneration in the female organs, absence of development of apogamic embryos, and susceptibility to anthracnose. In the more heavily bearing varieties at least one of the three factors, relatively few degenerations in the female organs, occasional development of apogamic embryos and resistance to anthracnose, promote fruitfulness. The introduction of a great number of bees into the mango grove is suggested as a means of increasing the productiveness of Haden.

1140. COLBY, A. S. 634.51-1.524(77.3)
The Crath Carpathian walnut in Illinois.
 Ill. Hort. 1943 : 32 : No. 2 : 4-5.

One of the most promising recent developments in Northern nut culture is the introduction of hardier strains of Persian walnut from the Carpathians, through the work of Crath. Over 20,000 seedlings have been widely distributed in the Northern States since 1937. The staminate catkins are evidently somewhat slower in appearing than the pistillate flowers. The pollination of the Persian walnut by the black walnut is regarded as a possibility.

1141. MACHADO, O. 634.573(81)
 634.573:576.312.35

Estudos novos sobre uma planta velha o cajueiro (*Anacardium occidentale* L.).
 [New studies on an old plant, the cashew nut (*A. occidentale* L.).]

Rodriguésia, Rio de J. 1944 : 8 : 19-48.

Notes are given on the origin of the genus *Anacardium* and its species. In *A. occidentale* L. the chromosome number $2n = 30$ has been determined. A description is given of the species, with indications of the multiplicity of names under which it is known, and of its uses in medicine. A key for the determination of the other species is provided.

1142. HAAS, A. R. C. 634.62:581.192
Chlorine accumulation in date palm varieties.
 Bot. Gaz. 1944 : 106 : 179-84.

Varietal differences in the chlorine content of date palms are reported. The variety Deglet Noor tends to have a lower percentage of chlorine per unit dry matter than the other varieties tested.

1143. FRANCOLINI, F. 634.63:581.321.1(45)
 Ancora sulla riproduzione agamica dell' olivo. (Once again the question of
agamic reproduction in the olive).
 Ital. Agric. 1942 : 21 : 538-42.

Details are given of ten years' observation of experiments in Umbria on the above problem. The writer asserts that there is no longer any doubt about the desirability of adopting agamic reproduction of the olive and especially from "ovuli", in the arid regions at the extreme climatic limits compatible with olive growing. He also suggests that (1) since resources are inadequate to meet growers' demands for olive trees derived from "ovuli", nurseries for supplies of such trees should be established on olive farms; (2) growers could also retrieve supplies of "ovuli" from healthy tissue from material among any of their own trees blown or cut down or otherwise eliminated.

1144. WOLFE, H. S. and LYNCH, S. J. 634.651:581.162:575
Papaya culture in Florida.
 Bull. Agric. Ext. Serv. Fla 1942 : No. 113 : Pp. 35.

The botanical relationships, flower structure and sexual variations in *Carica Papaya* L. are described. The need for elimination of plants that produce flowers of an intermediate type is stressed. Fairly pure varieties of papaya have not yet been produced. The possibilities of mass selection are described.

1145. RUEHLE, G. D. 634.653-2.422.1-1.521.6
The cause and control of avocado scab.
 Pr. Bull. Fla Agric. Exp. Sta. 1943 : No. 580 : Pp. 4.

Reference is made to the susceptibility and resistance of avocado varieties to scab.

1146. SLATE, G. L. 634.711:575(74.7)

Methods and problems in raspberry breeding.

Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 255-58.

This article summarizes the methods and problems of raspberry breeding at the New York Experiment Station.

In the breeding of red and black raspberries, intervarietal hybridization has been a satisfactory method. Red raspberry crosses from which promising selections have been obtained include crosses of Lloyd George with Newman, Newburgh, Herbert, Viking and N.Y. 1950, and the cross Taylor x Cuthbert; all these crosses are between unrelated varieties. In the inbreeding of black raspberries little if any loss of vigour has been observed. Black and red raspberries have been crossed to produce the purple raspberry. Seedlings from crosses between F_1 purple selections and from the selfing of purple seedlings are usually much less vigorous than their parents. Much sterility is evident and the fruits show a general inferiority. The F_2 did not include any typical red or black raspberries. In the breeding of autumn-fruiting raspberries, usually derived from Lloyd George, F_2 populations have been obtained by selfing, sibbing and back-crossing. In all types of fertilization, reduction in vigour of the resulting seedlings has been marked. It is now proposed to produce seedlings by hybridization of unrelated forms.

The method of breeding now adopted in the control of mosaic is the production of klendusic varieties, i.e. varieties that do not become infected with virus. A number of promising selections of klendusic red raspberries are under test.

1147. COLBY, A. S. 634.711-2.483-1.521.6(77.3)

Plan now to eradicate raspberry anthracnose.

News Lett. Ill. St. Hort. Soc. 1945 : No. 2 : 1-3.

This article briefly discusses the selection of anthracnose resistant varieties.

1148. HILDEBRAND, E. M. and 634.72-2.8-1.521.6:575(73)

WEBER, P. V. 634.72-2.4-1.521.6:575(73)

Varietal susceptibility of currants to the cane blight organism, and to currant mosaic virus.

Plant Dis. Reporter 1944 : 28 : 1031-35. (Mimeographed).

Preliminary results indicate the presence of considerable variation in the virulence of strains of the fungus *Botryosphaeria Ribis* Gross. et Dugg., the cause of cane blight in currants. Much variation in resistance and susceptibility was shown among the 55 varieties tested with a highly virulent culture. The varieties were also tested for reaction to the currant mosaic virus. 63.6% of the varieties were found to be susceptible.

The two most widely grown commercial varieties, Wilder and Red Lake, are susceptible to cane blight. Red Lake appears to be resistant to mosaic virus. The differing reaction among currant varieties to both diseases offers opportunities for the further improvement of this fruit.

1149. DARROW, G. M.,
WOODWARD, O. and
MORROW, E. B. 634.73:575.12:575(73)

Improvement of the rabbiteye blueberry.

Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 275-79.

A number of intervarietal crosses have been made with the object of obtaining further improved commercial varieties.

High positive correlation was found between glaucousness of leaf and blueness of berry. For all crosses at two locations the average of the desirable blue fruit obtained from blue-fruited parents was 40%, the average from the cross black-fruited x blue-fruited 18%. No crosses between two black-fruited varieties gave any blue-fruited seedlings. The seedlings of certain crosses were highly resistant to mildew and a leaf-spot disease at both locations. Berry yield in several selections was promising.

1150. MEADER, E. M. and
DARROW, G. M. 634.73:575.14:575.12:581.6

Pollination of the rabbit-eye blueberry and related species.

Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 267-74.

In a one year's test under greenhouse conditions, 9 out of 10 varieties of the rabbit-eye blueberry,

Vaccinium Ashei, were either partially or completely unfruitful when selfed. The variety Blue-boy, however, was completely self-fruitful. All varieties produced larger berries when cross-pollinated than when selfed, the increase in berry size ranging from 18–178%. Berries produced by cross-pollination usually ripened sooner than berries resulting from selfing; crossed berries of the variety Myers ripened on the average as much as 24 days earlier than the selfed berries. Large size of berry was associated with a high seed content per berry.

The pentaploid hybrid M29, obtained from the cross between the tetraploid high-bush blueberry and the hexaploid rabbit-eye was self-sterile, but set over one-half of its flowers when pollinated with either the rabbit-eye variety Myers or the high bush variety Stanley. The available clone of the tetraploid species *V. virgatum* was self-sterile. A plant of *V. Myrsinites* was self-fertile. The two diploid species *V. tenellum* and *V. Darrowi* gave a poor set of fruit when selfed, and a much greater set when cross-pollinated. In general, increase in berry size and seed content and earlier ripening were associated with cross-pollination in the tetraploid and diploid southern species as well as in the chief varieties of rabbit-eye blueberries.

1151. FAGERLIND, F. 634.74:581.162.5:576.312.35:575.127.2
 Kompatibilität und Inkompatibilität in der Gattung *Rosa*. (**Compatibility and incompatibility in the genus *Rosa***).
 Acta Hort. Berg. 1944 : 13 : 247–302.

A detailed account is given of hybridization experiments with species of the genus *Rosa*. Most of the diploid species are fertile *inter se*, the exceptions being principally confined to those species which have on systematic grounds been often allotted to different genera. The combinations $4n \times 4n$ and $6n \times 6n$ are also highly fertile.

Fertilization between normal rose species having different chromosome numbers is effective in many cases, the following combinations having been tried: $2n \times 4n$, $2n \times 6n$, $2n \times 8n$, $4n \times 6n$, $4n \times 8n$ and $6n \times 8n$. Embryo viability in these cases however is very variable, ranging from 0 to 100%.

Crosses between *R. rugosa* and garden roses are difficult to effect and only a single success is quoted.

Many crosses are also reported between the anomalous roses of the Caninae group and forms with normal meiosis. Tetraploid, pentaploid and hexaploid Caninae races were crossed with $2n$, $4n$, $6n$ and $8n$ species characterized by typical reproductive systems. Crosses with diploid species are easily made but combinations involving higher polyploids give rather variable results.

In all the cases described, individual incompatibilities and reciprocal differences in compatibility are important, being most striking in the crosses derived from the Caninae roses. These results are discussed exhaustively in relation to the concept of genome compatibility and the general problem of the factors determining intraspecific and interspecific incompatibility. The evolutionary importance of interspecific incompatibility is emphasized.

1152. MILLER, J. C. 634.75:575(73)
Strawberry breeding problems.
 Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 259–62.

The main problems of strawberry breeding in the United States are discussed, with reference to plant characters and productivity, resistance to diseases and insects, fruit productivity, characters of the fruit, type of calyx and suitability for processing.

1153. CLARK, J. H. 634.75:575.12
The place of the Lupton variety in the New Jersey strawberry breeding program.
 Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 263–66.

The data obtained indicate that the Lupton variety has characters which render it a valuable parent in the breeding of strawberry varieties for cultivation under conditions in New Jersey. By continued crossing with other varieties, particularly with Fairfax and hybrid seedlings having Fairfax as one parent, selections were obtained which retained the desirable qualities of Lupton and produced a berry of a good edible quality.

1154. POWERS, L. 634.75:575.127.2:575
Strawberry breeding studies involving crosses between the cultivated varieties (x *Fragaria ananassa*) and the native Rocky Mountain strawberry (*F. ovalis*).
 J. Agric. Res. 1945 : 70 : 95-122.

This paper reports the progress made at Cheyenne, Wyoming, in breeding strawberries, and evaluates the methods used. The immediate objective of the breeding programme is to recombine the large size of fruit of the commercial varieties (x *F. Ananassa*) with the winter hardiness of the native Rocky Mountain strawberry (*F. ovalis*).

Hybridization followed by inbreeding was found to be the most promising method of obtaining immediate practical results. The F_1 hybrid of Fairfax x collection No. 37501 of *F. ovalis* had the greatest number of plants combining extreme winter hardiness of fruits sufficiently large for economic production. F_1 hybrids involving Fairfax and collections 36979 and 361477, however, did not possess large fruit. It is evident that genes are present in some collections of *F. ovalis* which in the F_1 hybrid of crosses with x *F. Ananassa* allow the almost complete expression of the genes for large fruit size. Further breeding programmes should therefore include the production and testing of a large number of F_1 hybrid plants involving the crossing of a number of collections with several commercial varieties.

Back-crossing the F_1 hybrid to the cultivated parent has also shown good results. The fruits falling in a desirable class are on the average larger in the progeny of the back-cross to Fairfax than F_1 fruits of a similar class. Further work should therefore include back-crossing to the commercial parent and also outcrossing to a number of the other cultivated varieties, with the rigid selection of large-fruited F_1 hybrids.

Double crosses are particularly promising as a breeding method, because of the comparatively large proportion of the population possessing winter hardiness, the marked vegetative vigour often obtained, and the outstanding productiveness of some of the plants. The double cross F_1 (Fairfax x 36979) x F_1 (Dorsett x 37501) was particularly promising. On an average, one individual per 100 plants of such a double cross was found to recombine the following desirable characters: extreme winter hardiness, large fruits, exceedingly vigorous plants, ability to produce a large number of runners and a date of maturity and quality of fruit similar to those of the commercial parents involved.

Only in the case of number of days from 1 May to first bloom and number of days from first bloom to first ripe fruit did genetic linkage reduce the number of plants combining desirable characters. Other cases of linked inheritance either helped in obtaining the desired combinations or were without effect. Altogether 74 promising selections were obtained from the breeding material involving crosses between the cultivated varieties and the native Rocky Mountain strawberry. The reason why, comparatively speaking, it was possible to obtain so many promising plants in general and from the double cross population is the mode of inheritance of the desirable characters. Winter hardiness and capacity to produce runners show almost complete dominance; larger size of fruit is partially dominant; the number of days from 1 May to the first ripe fruit and plant height exhibit heterosis.

An investigation of the germination of seeds was made which has direct bearing upon any breeding programme. The maternal parent was found to have a preponderant influence upon percentage and time of germination.

1155. POWERS, L. 634.75:575.127.2:576.3:575(73)
Meiotic studies of crosses between *Fragaria ovalis* and x *F. ananassa*.
 J. Agric. Res. 1944 : 69 : 435-48.

Cytological data have been obtained from three cultivated varieties of strawberry (x *Fragaria Ananassa*), three collections of the Rocky Mountain native strawberry *F. ovalis*, and three interspecific F_1 hybrids.

New formulae for χ^2 are given, which reduce the calculation when the number of categories of the table used is large.

The data obtained indicate that allosyndesis is the rule during meiosis of the F_1 hybrids.

In view of the fact that meiotic instability is unimportant under the environmental conditions at Cheyenne, Wyoming, the recombination in a single variety of the economically valuable characters of x *Fragaria Ananassa* and *F. ovalis* appears to be a possibility, at any rate under the environmental conditions in question.

1156. BAIN, H. F. and DEMAREE, J. B. 634.75-2.411.4-1.521.6(73)
Red stele root disease of the strawberry caused by *Phytophthora fragariae*.
 J. Agric. Res. 1945 : 70 : 11-30.

The morphological and physiological characters of *Phytophthora Fragariae* Hickman are described in detail. Inoculations have indicated that *Fragaria* is the only genus susceptible to infection, and that within the genus, species and commercial varieties vary in susceptibility. The breeding of resistant strains appears to be the most promising method of control.

1157. 634.774:581.143.32:575.42
 Miscelánea agrícola. 28. (**Agricultural miscellany. 28**).
 Bol. Agric. Territorios Españoles del Golfo de Guinea 1943 : No. 7 : 87-88.

Various abnormalities in the fruit of the pineapple variety Smooth Cayenne are described and cited as evidences of degeneration. It is hoped that selection and maintenance of soil fertility will alleviate this problem.

1158. 634.774:581.165
 Miscelánea agrícola. 10. (**Agricultural miscellany. 10**).
 Bol. Agric. Territorios Españoles del Golfo de Guinea 1943 : No. 7 : 81-82.

The pineapple variety Smooth Cayenne is figured and described, and information is given on the times taken to reach maturity by cuttings of various sizes.

1159. KERTESZ, Z. I. 634.835:581.192(74.7)
The chemical composition of maturing New York State grapes.
 Tech. Bull. N.Y. St. Agric. Exp. Sta. 1944 : No. 274 : Pp. 13.

The sugar-acid ratio, the difference between the total soluble solids content, and the true total sugar content were determined in several varieties of grapes in 4 districts in the State of New York. It appears that none of these values is suitable to define the maturity of grapes in any given variety, because seasonal variation and differences due to location were found to be more important than those occurring between immature and mature grapes.

1160. SCHERZ, W. and SEEMANN, J. 634.835-2.111-1.521.6:575.11
 Schäden an Reben durch Spätfröste und die Aussichten ihrer züchterischen Bekämpfung. (**Injuries in vines through late frosts and the prospects of combating them by breeding**).
 Züchter 1944 : 16 : 25-35.

A detailed consideration is given to the problem of frost resistance in the vine, true physiological resistance being distinguished from the spurious resistance deriving from morphological features or from late development. Varietal differences are important but selection is made difficult on account of the effect also exerted on the character of frost resistance by other environmental factors.

The following resistant forms are mentioned: Rip G1, C 126-21 [C 601 (Bourrisquou x Rup G₂) x Gamay], San Michele A [Rip x Rup], Rip pub Klost, Berl Ress 1 x Rip Gloire, G 157 [Sol x Ries], G 155 [Sol x Ries], G 152 [Sol x Ries], MG 108-103 [Rip x Rup], G 58 [Ries x Rip] and G 57 [Ries x Rip].

It is believed that varieties derived from *Vitis vinifera* are not so susceptible to late frosts as the American varieties, although the latter may be more resistant to winter frost. *V. vinifera* presumably carries a gene or gene complex conferring this resistance, and a short account is given of the theories suggested to explain the proximate causes of this type of behaviour.

FORESTRY 634.9

1161. ANDERSSON, E. 634.97:575(48.5)
 Verksamheten vid värmlands- och norrlands-filialerna. (**Work at the Värmland and Norrland branch stations**).
 Svensk PappTidn. 1944 : 47 : No. 15 : 376-78; No. 17 : 427-33; No. 18 : 449-51.

The writer gives an account of (1) the reasons for decentralization of research on forest tree breeding and the consequent establishment of branch stations of the Association for Forest Tree

Breeding at Dalfors, Backe and Brunsberg; and (2) the surveys made of conifers and other species in various parts of Sweden to obtain suitable elite trees or stands for breeding (cf. *Plant Breeding Abstracts*, Vol. XIV, Absts 1005 and 1004).

More funds and increased facilities have resulted in a great extension of nursery work in various districts.

The procedure to adopt in progeny testing and the laying out of field experiments, as well as the statistical basis of a proper selection of local seed to obtain reliable standards for the comparison of plant material, are instructively discussed. The need for large numbers of plants in such trials, with the necessary parallel experiments, is stressed.

The time required for progeny testing is long but after 15 years it is possible to form an estimate of some features such as crown shape or increment capacity (in the pine); other characteristics, e.g. natural pruning and stem rot resistance, require longer. Stress is laid on the importance in progeny testing of the production per unit of area and not the production of the individual tree. Conifers will occupy the most important place among the breeding material at the Brunsberg and the Norrland stations, though at Brunsberg other species, e.g. aspen, birch and alder, have also been used in variety trials.

In 1940, a photoperiodism experiment with pine and spruce was begun in Backe and in 1943 birches were included. In 1943, a similar study was started at the Malgomaj School, 15 km. north of Wilhelmina. Though the experiment is still in progress, certain deductions as to the undesirability or otherwise of transferring pine to different latitudes are suggested by the tendencies common to the progenies of the various individual pine trees.

Results from the work in progress on vegetative multiplication of conifers, by grafting and by cuttings are recorded, with due acknowledgements to Syrach Larsen, Holger Jensen, H. Johnsson and C. L. Kiellander, all of whose work has already been reviewed (cf. *Plant Breeding Abstracts*, Vol. XIV, Absts 1004 and 1005). Cuttings from younger trees rooted better than those from older trees, the percentages of cuttings that took being 20 and 10 respectively. In 1943, more experiments of this kind were begun with spruce and pine cuttings from trees of different ages and taken exclusively from the lower third of the crown.

The great importance of grafting in obtaining as many individuals as possible from elite trees by multiplication is stressed. Pine can be multiplied only by grafting, whereas with spruce, cuttings and grafting are both successful. A further possibility is mentioned of testing (1) whether spruce trees obtained by grafting will react as young or old trees, when used for cuttings, and (2) how such cuttings develop, as compared with seedlings.

Next winter the raising of graft trees from the best phenotypes of conifers is to be begun at the main stations at Brunsberg and Sundmo. It has not yet been possible to identify genotypically elite trees. The method is admittedly uncertain since seed plantations have to be laid down from trees that have not been progeny tested. The phenotypically elite trees can, however, be progeny tested during the 30 years or so required for the grafted trees and the seed plantations (laid down from them) to grow up. The results of the progeny tests can be used to thin seed plots before their first flowering, while at the same time eliminating the corresponding grafted trees derived from trees with inferior progeny. By this procedure, when the progeny trials are completed, full grown seed plantations are available as a source of high grade seed without delay.

A nursery study of the relation between early growth and the subsequent characteristics of the tree is being conducted at the Brunsberg and Dalfors stations. Exact measurements are made each year both of individuals and lots grouped according to their mother trees. Considerable differences can be observed in development when the tree is as young as 2-years old, though no final conclusions on which selection could be based can yet be drawn from these differences. There is however still no prospect of applying early selection to qualitative characteristics and production per unit of area, for which the full procedure of progeny testing is necessary.

The progeny of rot free (*Fomes annosus*) spruces from severely infected stands are being laid out, separately grouped according to the mother trees, in highly infected localities. Similar experiments were also laid down in 1942 in Gröttvål (Gunnarskog parish) with progeny from sound trees in Gyllebo crown forest in Scania. It is possible that by crossing completely uninfected spruces in seriously affected stands and by long continued selection among the progeny, more or less resistant trees might be obtained in the future. Undoubtedly individual birches differ too in rust infection and H. Klebahn and Erik Rennerfelt have recorded similar variation (probably genetic), in the susceptibility of pine to *Peridermium*. Erik Rennerfelt is working also on rot resistance in the spruce.

Early work of the Värmland Station included the erection of about 10 scaffoldings round selected phenotypically élite trees of spruce and pine in Värmland (fig. 18). In 1942, crosses were made on a large scale with superior trees of these kinds. In estimating the practical value of the hybrid progenies the parent trees were also progeny tested after having been allowed to set seed under conditions of open-pollination within the respective stands.

In view of the labour and time required for artificial crossing, it is likely that gradually improvement work will come to be based more and more, and ultimately entirely, on controlled crossing, e.g. on spatially isolated seed cultures laid down with vegetatively propagated material: (1) from trees with superior progeny, and (2) from parent trees of superior crosses. Such seed plots will be isolated from stands and individuals of the same species so that all seed from the plots must consist of hybrid seed from the genotypically élite trees in the stand.

In consequence of storm damage to trees and equipment and the failure of spruce to flower in spring 1943, artificial crossings by means of scaffolding are confined now to élite pines.

During 1943 the work of the branch stations was completely reorganized, the Association having decided to locate one main branch station in Ångermanland as a centre for all breeding work for Norrland. The Strömnäs Co. Ltd. let accommodation for a branch station at Sundmo (15 kilometres west of Adälsleden) and the Association undertook to see to further requirements; the work was to be completed by November 1944. The cost of buildings and equipment, etc., is estimated at about 225,000 kr.

The programme of work comprises (1) the use of specially good stands for seed collection for economic purposes; (2) seed collection from superior trees, following open-pollination in the respective stands, and in connexion therewith the laying down of plantations for seed raising from progeny planted in separate groups for each mother tree; (3) the laying down of seed plots for seed raising, with clonal material taken from plus-variants or from élite phenotypes. The procedures (2) and (3) will be followed by the elimination of daughter plants and clonal plants from any original trees that may be found to have inferior progeny. This selection is made before the first flowering of the seed plots and is based on the performance of the progeny of plus-variants which have been left to set seed under conditions of open-pollination within the stands. The actual progeny tests are however regarded as part of plant breeding operations. Selection not based on progeny tests is regarded as a silvicultural operation and not plant breeding, the dividing line between silviculture and plant breeding being based on the inclusion or absence of progeny testing.

Plant breeding includes (1) individual progeny testing of selected élite phenotypes from various stands and all sample trees in sample areas; (2) artificial crossing between plus-variants within different species of trees followed by progeny testing with the hybrid seed; (3) when satisfactory evidence has been obtained from progeny experiments, the utilization of the stands that give the best progeny as "live seed stores", and the laying down of seed plots with vegetatively reproduced material (a) from élites with superior progeny, and (b) from parent trees of superior hybrids; and (4) further breeding ultimately with the best genotypic élites obtained both artificially and by repeated selection.

Co-operation between commercial forestry concerns and the official silvicultural authorities in Värmland was specially active and (on the Uddeholm Company's land) at Uddeholm forest tree breeding has been begun which is to be conducted in intimate collaboration with the Association for Forest Tree Breeding and its Brunsberg branch in particular. The breeding programme at Uddeholm is mainly concerned with the regeneration problem on the company's land, though the experiments are also intended to be of general use ultimately. As regards pine and other trees, the prevention of deterioration by cross-pollination of trees provisionally chosen as seed producers is stressed, as well as the importance of removing all *Peridermium* infected trees from stands that are to be used for economic seed production.

In various forest districts of Uddeholm, instruction in the requirements of the breeder as regards élite trees was arranged for all forestry personnel of the Uddeholm Co. Ltd., and their attention was drawn to the importance of their work as a contribution to the future improvement of forest trees.

An expression of gratitude from breeders to foresters for their co-operation concludes the article.

1162. JENSEN, H. 634.97-1.531.12:581.165.71(48.5)

Om elitfröplantager. (On élite seed plantations).

Skogen 1945 : 32 : 74-77.

The establishment of seed plantations to provide Sweden as rapidly as possible with adequate

supplies of high grade seed of forest trees is discussed in detail from the following aspects: (1) the size, scope and distribution of elite seed plantations among forestry concerns; and (2) the time needed for such a project and its cost.

To produce the required 75 tons of seed per annum, 1500 ha. of seed plantations in bearing, i.e. about 1,500,000 small trees in bearing are needed. Two ways of meeting these requirements would be: (1) to start exclusively from grafts of elite clones; or (2) to lay down basic elite seed plantations with the same clones, but on a much smaller scale, and to select from seed progeny the best 5% of plants for the laying down of the final seed plantations.

Method (1) would solve the problem of producing sufficient cuttings for scions within four to six years after the first graftings on the elite trees, while method (2) has the advantage that improvement of the quality of the seed in the final seed plantations is possible by selective thinning to increase the dominance of desirable characters over any undesirable ones that cross-pollinated trees (e.g. pine and spruce) may carry.

Suggestions on how to obtain an adequate annual supply of young scions are made on the basis of the author's own results, and his findings as regards climatic requirements and provenance as factors in grafting operations in Sweden are also set out.

To ensure that enough new combinations between the genotypes brought together in the seed plots shall ensue, six or more trees per provenance area should be chosen.

The requisite size of the initial plantations for the whole country and the cost of producing plantation seed are discussed as well as the special applications of such seed plantations to birch forms.

The instruction and provision of trained staff is necessary to carry out such a programme of seed production.

1163. WOLF, C. B. 634.972.1:575.127.2(79.4)
The Gander oak, a new hybrid oak from San Diego County, California.
 Proc. Calif. Acad. Sci. 1944 : 25 : 177-88.

Seedlings of the natural hybrid oak x *Q. Ganderi* have been observed, and have provided sufficient data for the conclusion that this oak is a hybrid between *Q. Kellogii* and *Q. agrifolia* var. *oxyadenia*. It is believed that x *Q. Ganderi* is of economic value. The hybrid has many of the fine characters of *Q. Kellogii*, and shows a vigorous growth rate and hardiness at low altitudes.

1164. SYLVÉN, N. 634.972.1:575.42(48.5)
 Eken i det svenska skogsbruket. (The oak in Swedish forestry).
 Svensk PappTidn. 1944 : 47 : p. 522.

The need is stressed for saving good oak trees and stands from the axe and for planting superior stands for future use. A Swedish "Society for the Promotion of Oak Cultivation" has been formed.

1165. WETTSTEIN, W. VON 634.972.3:581.5:575.12
 Möglichkeiten der Züchtung neuer Ökotypen nach Kreuzung. (Possibilities
 of breeding new ecotypes after hybridization).
 Züchter 1942 : 14 : 282-85.

Data are given to show that the dates and growth rates of aspen plants may be altered by inter-crossing ecotypes from different localities. Other characters, such as winter-hardiness and photoperiodic adaptation, also vary with the ecotype.

1166. GRUENHAGEN, R. H. 634.972.3-2.421.9-1.521.6:578.08
Hypoxylon pruinaum and its pathogenesis on poplar.
 Phytopathology 1945 : 35 : 72-89.

By means of inoculations of *Hypoxylon pruinaum* through bruised tissue, a method has been developed for testing the relative resistance of various selections of poplar.

1167. JOHNSON, H. 634.972.6:575.127.2(48.5)
Interspecific hybridization within the genus *Betula*.
 Hereditas, Lund 1945 : 31 : 163-76.

The period of fructification was successfully forced by the method of "bottle-grafting". In general crosses between species belonging to the different subgenera *albae* and *costatae* are highly fertile. Crosses between species of the same subgenus are to a large extent interfertile as shown by studies of *albae*.

B. verrucosa, a diploid species with $2n = 28$, has been crossed with several other species. All crosses showed a reduced fertility. The combinations *B. verrucosa* x *B. papyrifera* and particularly *B. verrucosa* x *B. japonica*, however, possess good fertility. The hybrids are markedly heterotic, showing an increased rate of growth. An exceedingly low fertility is shown by the combinations *B. verrucosa* x *B. Ermani* and *B. verrucosa* x *B. Maximowicziana*. In both cases the parent species belong to different subgenera.

Hybrids between the tetraploid species *B. pubescens* and *B. papyrifera* show good fertility and pronounced heterosis.

The cross between the 2 *albae* species *B. pubescens* x *B. verrucosa* and the reciprocal cross are, however, extremely sterile. The results obtained are discussed with reference to the sterility of the cross *B. verrucosa* x *B. pubescens* and to the general view held that the numerous intermediate forms between these two species occurring naturally are of hybrid origin.

1168. ROCKWELL, F. I. 634.972.8:575.127.2:575(78.3)
What kind of trees shall I plant?
 N. S. Dak. Hort. 1945 : 18 : p. 40.

Mention is made of a promising new variety of elm, a first generation hybrid of the Chinese and the red or slippery elms. Seedlings planted in Dakota in 1938 show promise as shade trees and when subjected to severe weed competition. At least half of the stock equalled the Chinese elm in growth rate, but did not show the latter's susceptibility to weather injury.

1169. SCHMIDT, W. 634.975:576.16:578.08(43)
 Das Ostwestgefälle der Kiefernrasen, neue Einblicke und Methodenvorschläge für internationale Versuche. (**The gradient from east to west of the pine races: new aspects and suggestions for international experimentation methods**).
 Intersylva 1943 : 3 : 473-94.

Extensive comparative tests of pine trees of different German provenances have been made, special attention being paid to timber yield, tree shape, healing capacity, climatic adaptability and resistance to needle shedding. Methods whereby adequate comparisons can be made are discussed. The results quoted in this article point to a general racial deterioration in the lowland German pines from east to west.

VEGETABLES 635

1170. 635:577.16:001.4
Wartime agricultural research.
 56th Rep. R.I. Agric. Exp. Sta. 1944 : Contr. 659 : Pp. 46.

Detailed analyses for ascorbic acid and carotene were made in varieties of green peppers, peas, beets and carrots. Variations in carotene and ascorbic acid were found to exist between different varieties of carrots sufficient to be important in diets low in these vitamins; no significant differences were found in pea and table beet varieties. Vitamin C variations were significant among pepper varieties, while carotene differences were very small.

1171. SCHUPHAN, W. and EUN, E. 635.13:577.16:581.175.11:575.42
 Über die Beziehungen zwischen Färbung, Carotingehalt und Geschmack bei Gartenmöhren. (**The relation between coloration, carotene content and flavour in carrots**).
 Züchter 1944 : 16 : 11-25.

Carrot varieties vary much in their colour, the ratio of the cortical and medullary volumes and their carotene content. The investigations reported have attempted to elucidate the inter-relations of these various characters with the object of facilitating selection for carotene content. It was found, however, that no correlation could be drawn between depth of colour and carotene content, since other pigments, such as xanthophyll, xanthophyll ester, apigenin and lycopene, contribute to the resultant colour blend. Also, the texture of the tissues, in particular the diameter of the vessel lumina also affects the shade of pigmentation. Flavour is not correlated with carotene content, but the forms with superior taste appear to occur most frequently in varieties with a dark red medulla.

In the light of these findings, the following selection technique is recommended. Varieties should be selected first for superior shape and deep red cortical and medullary pigmentation; the samples should next be tested for colour permanence after cooking and for flavour; and then, the remaining forms should be analysed for their carotene content.

1172. KEPLER, E. 635.15:575.125
 Inzuchtleistungen und Bastardierungseffekt beim Radies (*Raphanus sativus*).
 [Inbreeding performance and the effect of hybridization in radish (*R. sativus*)].
 Z. Pflanzenz. 1941 : 23 : 661-84.

After a preliminary mention of two theories as to the cause of heterosis, viz. (a) the suggestion that a stimulatory substance is produced, and (b) the alternative suggestion that gene interaction is the relevant cause, the author gives an account of the genetical behaviour of inbred radish families. Segregation was observed in habit, mode of development and root morphology, and the salient characteristics of the various lines developed are described. After several generations of inbreeding, 14 superior and 15 inferior families were selected for crossing *inter se*, and it was found with one exception, that crosses within a single family were less vigorous than those between different families, and that crosses within superior families produced more vigorous offspring than those within inferior families.

It is concluded that inbreeding depression and heterosis are determined genetically, the latter either by cumulative or complementary gene action. A high correlation, however, could not be established between inbred and hybrid vigour. The practical bearing of these findings is discussed.

1173. USTINOVA, E. I. 635.26:581.142:581.162.5
 [A comparative-embryological study of normal and viviparous onion species (*Allium*)].
 J. Bot. U.R.S.S. 1944 : 29 : 232-39.

A study was made of the sterility associated with vivipary in certain species of *Allium*. Eight species belonging to different sections were examined and the investigations showed that no clear line of division exists between the co-called viviparous and the so-called normal species, since most species show tendencies towards vivipary in varying degrees; it is least in *A. coeruleum* and *A. oleraceum* and most in *A. proliferum*.

The reduction division in the normal species was found to be quite normal and so was embryo-sac and pollen formation. In the viviparous species, however, several anomalies of chromosome behaviour were observed in the formation of the pollen mother-cells, such as lagging chromosomes and formation of micronuclei; the anomalies were most pronounced in *A. proliferum*, where the pollen was highly deformed and sterile. The germinating capacity of the pollen was low and in *A. carinatum* and *A. proliferum* no pollen germinated at all.

Similar meiotic irregularities were observed in the formation of the megaspores in the viviparous species. Pronounced degeneration of the embryo-sacs was observed in *A. coeruleum*, *A. Scorodoprasum* and *A. proliferum*.

The most successful method of overcoming the sterility of the viviparous species was the removal of the bulbils some 10-15 days or more before flowering. By this means a 12.5% seed set was obtained in *A. oleraceum*, 7.3% in *A. coeruleum* and 7.1% in *A. Scorodoprasum*. Other influences, such as adjusting the photoperiod, growing on poor soil and in different localities, were without effect in overcoming sterility.

1174. POOLE, C. F.,
 HEINZE, P. H.,
 WELCH, J. E. and
 GRIMBALL, P. C. 635.34:577.16
 Differences in stability of thiamin, riboflavin, and ascorbic acid in cabbage varieties.
 Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 396-404.

The average content of ascorbic acid and riboflavin in 7 strains showed a significant positive correlation. Thiamin content was an independent variable. An inbred line Volga-1, contained more riboflavin and more ascorbic acid than 5 other strains. When stored at room temperature, this line lost ascorbic acid at a slower rate than 2 other strains with which it was compared; at

refrigerated temperatures it retained more ascorbic acid than either of the 2 strains but the rate of loss was significantly slower in only one of the two comparisons. Copenhagen Market was inferior to any strain in yield of the two B vitamins. With one exception, those strains which showed significant seasonal differences in ascorbic acid content failed to show such differences in thiamin content.

1175. J. JANES, B. E. 635.34:581.192
635.652:581.192
The relative effect of variety and environment in determining the variations of per cent dry weight, ascorbic acid, and carotene content of cabbage and beans.

Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 387-90.

An analysis was made of the percentage dry weight, ascorbic acid and carotene content of 2 varieties of cabbage, Early Jersey Wakefield and Copenhagen Market, and 2 varieties of beans, Tendergreen and Bountiful. Location was a much more important factor influencing composition than variety.

1176. DETJEN, L. R. 635.34-1.531.12:581.165(73)
Fixation of cabbage varieties.
Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 362-66.

Vegetative propagation of the original plants used in seed production is suggested as a means of fixation of cabbage varieties. Only one plant will be required for the production of a clone of a self-compatible type. Selected pairs will be necessary in the propagation of a self-incompatible type. Three methods of propagation are described.

1177. WALKER, J. C. 635.34-2-1.521.6:577.16:575
Progress in combination of yellows and mosaic resistance with high ascorbic acid content in cabbage.
Phytopathology 1944: 34 : 1012-13. (Abst.).

Lines of the Wisconsin All Seasons cabbage homozygous for the gene controlling resistance to yellows (*Fusarium oxysporum* f. *conglutinans*) have been isolated. Lines highly resistant to mosaic have been secured by inoculation of the yellows resistant lines with cabbage mosaic viruses (a strain of the turnip virus 1 and a strain of the cauliflower virus 1) and by subsequent elimination of susceptible plants. Lines with 60 mg. or more of ascorbic acid per 100 gm. of fresh tissue have been obtained.

1178. WHITAKER, T. W. and PRYOR, D. E. 635.52:578.08:632.411.4-1.521.6
Demonstrating downy mildew (*Bremia Lactucae*) in lettuce.
Stain Technol. 1943 : 18 : 121-23.

In the course of an investigation of the physiological basis of varietal differences in reaction to downy mildew in lettuce, a method has been devised for the study of the development of the fungus in the host tissue.

1179. Slobolt, new summer leaf lettuce, lasts longer. 635.52:581.143.26:575
Sth. Seedsman 1945 : 8 : No. 3 : p. 51.

A new variety of lettuce, Slobolt, has been produced at the Plant Industry Station, Beltsville, Maryland, as a result of ten years' breeding and selection. It withstands midsummer temperatures without quickly bolting, producing marketable leaves for a period of three weeks longer than the established commercial varieties.

1180. SOLIS, M. A. 635.54:633.88(86)
Estudio botánico farmacognóstico de la achicoria de Quito: *Achyrophorus quitensis* Schultze Bip., var. de flores blancas. (Pharmacological study of the Quito chicory: *A. quitensis* Schultze Bip., variety with white flowers).
Flora, Ecuador 1942 : 2 : Nos. 5-6 : 79-97.

The taxonomic position, geographical distribution and ecology of *A. quitensis* are given, together with some notes on its medicinal usages.

Anatomical descriptions are also included.

J. G. H.

1181.

SHIFFRIS, O.

635.61/3:575.14:575.061.634

635.62:581.162.51:575.125

Male sterilities and albino seedlings in cucurbits.

J. Hered. 1945 : 36 : 47-52.

A morphological male sterility in *Cucurbita Pepo* L. is inherited as a simple recessive character. Its practical value in the production of hybrid seed is discussed.

A study was made of albinism in seedlings of inbred lines in species of *Cucurbita*, *Cucumis* and *Citrullus*. In the case of the genus *Cucurbita* the data obtained suggest that albinism is due to the presence of a lethal recessive gene.

The consequences of inbreeding in the cucurbits are discussed. The author is critical of the general view held among plant breeders that the cultivated cucurbits do not show loss of vigour as a result of inbreeding.

1182. IVANOFF, S. S.

635.611-2.411.4-1.521.6:575

Texas cantaloupe resists aphids, downy mildew.

Sth. Seedsman 1945 : 8 : No. 2 : 11, 28.

Resistant No. 1 is a new variety of cantaloupe, derived from a cross between an inbred strain of green-fleshed Rocky Dew musk-melon resistant to downy mildew and the susceptible Hale's Best. The new variety is not immune to downy mildew, but shows a high degree of resistance. It also shows considerable resistance to aphid and melon worm attack. The fruit is small and the netting well-developed. The flesh is firm in texture and a rich salmon colour. The vine shows marked longevity.

1183. WALKER, M. N.

635.615:575(75.9)

The Blacklee watermelon. A new *Fusarium* wilt-resistant variety for Florida.

Pr. Bull. Fla Agric. Exp. Sta. 1944 : No. 605 : Pp. 4.

The Blacklee is a new variety of water-melon suitable for cultivation in wilt-infested soils in Florida and probably in other south-eastern States. The variety was obtained from a cross between the varieties Leesburg and Hawkesbury. It is highly resistant to *Fusarium* wilt, and no more susceptible to anthracnose, downy mildew and sunburn than the common commercial varieties. The yield is high, the flesh good in texture, the flavour excellent and the sugar content high. The external appearance resembles that of Kleckley Sweet. A particular character of the Blacklee is its apparent freedom from "white-heart".

1184. HAWTHORNE, P. L.

635.615:576.356.5

A polyploid watermelon.

Proc. Amer. Soc. Hort. Sci. 1944 : 45 : p. 348.

The occurrence of a polyploid plant of water-melon is reported. This plant possessed very large runners and broad heavy foliage. The flowers of both sexes and the pollen grains were about double the size of the normal flowers in the field. The plant exhibited natural resistance to anthracnose. The pollen did not prove to be viable when applied to the pistillate flowers of several varieties or when the flowers were selfed. Hybrid plants were produced by cross-pollination with wilt resistant strains. The seedlings obtained from the selfed seeds failed to survive.

1185. WALKER, M. N.

635.615-2.484-1.521.6:581.02:575.11

***Fusarium* wilt of watermelons. I. Effect of soil temperature on the wilt disease and the growth of watermelon seedlings.**

Bull. Fla Agric. Exp. Sta. 1941 : No. 363 : Pp. 29.

Conditions of soil temperature in relation to infection and injury by *Fusarium* wilt and seedling growth were studied in two varieties of water-melon, Tom Watson and Kleckley Sweet, and in three resistant citron strains (*Citrullus*).

The resistance shown by the citron strains appears to be relative, infection and development of the disease being less rapid than in the water-melons. The results of crosses between citrons and susceptible water-melons indicate that resistance is a recessive character.

1186. MILLER, J. C. 635.624:575.127.2:575
Longfellow pumpkin. Bred for south, it combines desirable qualities of its parents, cushaw and African squash.
 Sth. Seedsman 1945 : 8 : No. 3 : p. 13.

Longfellow is an improved variety of pumpkin, selected from a cross between the African squash (*C. Pepo*) and the cushaw (*C. moschata*). It is vigorous and adaptable, with a small seed cavity and a long neck. It matures in late June.

1187. SHIFFRIS, O. 635.63:575.125
Prolific 'Cuke' joins hybrid hits.
 Sth. Seedsman 1945 : 8 : No. 2 : 15, 26.

The Burpee Hybrid Cucumber is a new F_1 hybrid variety. Reports indicate that it will be particularly valuable as an all-purpose early cucumber in the South. In the East and Middle West it can be planted as a midseason variety. This new variety shows a greater tolerance to diseases than any available commercial variety.

1188. SCOTT, G. W. 635.64:575(73)
Tomato: King of processed vegetables—And the West held the Coronation.
 West. Cann. Pack. 1943 : 35 : No. 12 : 17-19.

Early Santa Clara Canner remains the standard variety for much of the California acreage. It has, however, the disadvantages of flat, rough fruit that tend to show a poor colour late in the season, and in certain districts it produces a large central core; also the thin skin cracks readily. Several other varieties with smoother, more desirable fruit types have been tried extensively during the past few years. MEO, Moscow and 133-6 have been found satisfactory in rather limited areas; Pearson has become a standard variety in several districts. This variety is self-topping with heavy, compact growth, producing a heavy set of smooth medium-large fruit, which decrease in size towards the end of the season to medium small. Since its release in 1943 the variety has been still further improved, Pearson-C being a strain now extensively used. Improved selections have been produced of the small-fruited Italian Pear or San Marzano type cultivated in south California.

Effort has been directed towards combining the desirable plant and fruit characteristics and yielding capacity of the Pearson type with the fruit quality and structure of certain late, large-fruited canning types. The new lines PX-1 and San Benito were offered for commercial trial in 1943. Both varieties have large, deep, smooth fruits of good quality, with a heavy skin free from cracking.

Various *Lycopersicon* species and strains collected largely from South America have been used in the development of a type with fruit intermediate between that of Pearson and San Marzano. Many interesting types are in prospect.

The variety Essar, introduced in 1940, is highly resistant to *Verticillium* wilt. The development of varieties resistant to *Fusarium* wilt is in progress.

1189. KOLEFF, N. 635.64:575"793"(43)
 Neues Zuchtziel bei der Tomatenzüchtung. (A new breeding objective in tomato breeding).
 Züchter 1942 : 14 : 264-66.

A brief summary is given of recent developments in the German tomato breeding programmes. Much attention is being paid to the production of early varieties, and interspecific hybridization between *Lycopersicon racemigerum* and *L. esculentum* has been effected for this purpose. Positive correlations have been established between early flowering and early ripening, and fruit size and fruit weight, and a negative correlation between the height of the lowest inflorescence from the ground and earliness. Varieties of the Cooper type have been crossed with the earliest forms of the strongly ribbed varieties Pomidori Arbanaski and Ficarazzi in order to combine earliness with desirable fruit characters.

Pritchard's Scarlet Top has been selected for frequency of inflorescence development, and a line (strain 39) has been segregated which produces inflorescences after every two leaves or even sometimes after every one. This new strain is being hybridized in order to increase the number of flowers per inflorescence and to advance the date of its maturation. Similar selections for inflorescence frequency have been made in the varieties Rougers and Stonors.

Determinate tomato varieties are also receiving attention and it is hoped that early determinate varieties will arise from hybridization between the late determinate varieties and early indeterminate tomatoes.

1190. CURRENCE, T. M.,
LARSON, R. E. and
VIRTA, A. A. 635.64:575.12:575.125

A comparison of six tomato varieties as parents of F_1 lines resulting from the fifteen possible crosses.

Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 349-52.

In 1943 a test was conducted co-operatively by the Minnesota and Rhode Island stations to study the productivity and general desirability of a number of F_1 hybrids and to compare the combining abilities of 6 varieties.

The highest yielding varieties were Earliana and Rutgers with yields of 7.26 and 11.04 tons per acre respectively at St Paul (Minnesota) and Kingston. The highest yielding crosses were Pritchard x Earliana and Rutgers x Pritchard, with yields of 9.61 and 16.75 tons per acre at St Paul and Kingston respectively. In view of such increased yields and a superior fruit quality, the cultivation of the hybrids is recommended on a commercial scale.

A difference in response to environment was observed in the hybrids. Rutgers was a poor parent in the test at St Paul but at Kingston the best, whereas Earliana was the poorest at Kingston but the most promising at St Paul. In both localities there appears to be a close agreement between yield of a variety and its general combining ability. In the possible estimation of the combining ability of varieties and strains by the use of a tester parent, it would appear that choice of a tester parent should be based on the performance of its progeny in the particular locality. It is, however, of interest to note that Pritchard was one of the parents of the highest yielding hybrids at each location in the present tests, which suggests that this variety may have a wide adaptability.

1191. LARSON, R. E. and
MARCHANT, W. L. 635.64:575.125:581.02(73)

The response of three F_1 lines and ten strains of tomatoes to two distinct soil types.

Proc. Amer. Soc. Hort. Sci. 1944 : 45 : 341-47.

A test was made of 3 F_1 hybrid lines and 10 pure varieties on 2 widely different soils to determine the possibility of varied response to soil type. Early yields were significantly greater on the Merrimac fine sandy loam (Hillsgrove, Rhode Island). Average fruit size, total yield and marketable yields were significantly greater on the Bernardston loam soil (Newport). This result indicates the probable necessity of breeding F_1 lines for a particular soil.

The F_1 lines were earlier in maturity than the earliest variety under test, and at the Newport location these lines outyielded all except one of the inbred varieties; this exception was not significant. At Newport the estimated cash returns from the F_1 lines showed an increase of 77-249 dollars per acre over those from the best inbred strain, and at both locations the F_1 lines would have brought higher returns on early yields.

1192. HASCHKOVA, O. 635.64:575.257:635.646
635.63:575.257:635.624

(Grafting as a means of plant transformation).

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : Nos 8-9 : 12-18.

Various tomato varieties were grafted on to egg plants, the leaves being removed from the tomato scions and the flower buds from the stock. The tomato fruits produced were normal in most respects but the number of seeds they contained was below normal. The seeds were sown and some of the seedlings were again grafted on to the egg plant. This time a marked reduction in growth rate was observed in some of the scions; flowering was delayed by 8 days in the variety Mario. The number of locules per fruit varied on the grafted plants, especially in the second generation of grafted fruits; the number of seeds was also less and some fruits of Mario and Pritchard had only 7-10; the flesh of the fruits was firmer, less juicy and more friable.

The seeds of the second generation of grafts were sown in 1941; in the seedlings produced the average fruit weight was higher than the controls, the number of seeds per fruit was only 2-7 and great variations were observed in the number of locules per fruit.

Grafts were made in 1940 of the cucumber Tokio on the pumpkin Mozoleevskaja and all the leaves were removed from the cucumber scion just before flower buds were formed. All the flower buds then fell off, together with the shoot, leaving only the cotyledons. From between these a new vigorous stem arose and soon produced flowers and fruits. These were very little different from the controls and their seeds were sown in 1941; the seedlings formed flower buds before the controls and formed almost exclusively female flowers. Very few fruits were formed owing to the limited number of male flowers; the 3-4 fruits that formed on each plant however ripened over 3 weeks earlier than the controls. The seeds were sown in 1942 and the seedlings ripened still earlier, almost a month before the controls. The flowers were pollinated artificially and a good yield was obtained.

The method of vegetative hybridization is thought to be a more effective method of plant improvement than hybridization proper.

1193. ALPATIEV, A. 635.64-2.111-1.521.6:575(47)
(Breeding frost resistant tomatoes for outdoor culture in Central Russia).

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1944 : Nos 8-9 : 3-11.

Seed of a number of tomato crosses was sown in the open in the early spring so that the seedlings were subjected to the effects of spring frosts in order to make use of natural selection. In this way several possessed of considerable degrees of hardiness were obtained; thus 4-8 day seedlings survived frosts of 3-4° C. in May and June of 1940 which sufficed to kill off the ordinary varieties completely. In the following year they survived 3-5° C. of frost. These hardy lines set fruit better than the parental varieties at low temperatures and their fruit ripened earlier than any known form; they exceeded the standard varieties such as Bison in yield by amounts varying from 31 to 76%. The best plants bore up to 60 fruits when grown in the open, the total weight being about 3 kg. of fruit per plant.

Descriptions are given of the six best hybrids, with indications of their parentage.

1194. ANDRUS, C. F. and 635.64-2.482-1.521.6:575.11
 REYNARD, G. B.
Resistance to *Septoria* leaf spot and its inheritance in tomatoes.
 Phytopathology 1945 : 35 : 16-24.

A considerable number of tomato varieties were inoculated with *Septoria Lycopersici*, the cause of leaf spot disease. All were found to be highly susceptible. Some degree of resistance was shown by 12 foreign varieties, these were known to have *L. hirsutum* or *L. peruvianum* as ancestors, or their characteristics were indicative of outcrossing with some wild type. The highest degree of resistance was characterized by a restricted type of lesion. Such resistance was shown to be inherited as a single dominant factor.

1195. CLARKE, E. J. and 635.64-2.484-1.521.6:575.11
 SHERRARD, G. O. 635.64-2.8-1.521.6:575.11
A leaf-spot on tomatoes and its relationship to the variety Vetomold.
 Gdnrs' Chron. 1945 : 117 : p. 71.

A leaf spot has been observed in a proportion of the F₂ generation of the crosses of the Canadian variety Vetomold with Scarlet Knight and Victory and of the cross Scarlet Knight x Allred. It occurs in the approximate ratio of three non-spotted plants to one spotted. The possibility is briefly discussed that the spotting is an expression in American or Canadian strains of reaction to disease or to mineral deficiency or excess under different environmental conditions, and that this reaction is genetically controlled. The ratio of *Cladosporium* infected plants in the same F₂ generations was 3 : 1. Any correlation existing between the leaf spot and *Cladosporium* infection appears to be negative.

1196. REYNARD, G. B. and 635.64-2.484-1.521.6:575.11
 ANDRUS, C. F.
Inheritance of resistance to the collar-rot phase of *Alternaria solani* on tomato.

Phytopathology 1945 : 35 : 25-36.

Tomato lines uniformly resistant and lines uniformly susceptible to the collar-rot phase of *A. Solani* were crossed and succeeding generations analysed for resistance or susceptibility to the

disease. A total of 15 F_2 populations, 251 F_3 families, and 23 back-cross populations involving crosses of resistant x susceptible parents was tested. The analysis indicated a simple form of inheritance involving one pair of factors. An intermediate type of reaction was observed in heterozygous seedlings, suggesting that susceptibility to collar-rot is incompletely dominant to resistance. The factor pair governing resistance was designated as $A_d a_d$.

1197. HEINZE, P. H. and
ANDRUS, C. F. 635.64-2.484-1.521.6:581.165.71
Apparent localization of *Fusarium* wilt resistance in the Pan American tomato.
Amer. J. Bot. 1945 : 32 : 62-66.

The resistance to *F. oxysporum* f. *Lycopersici* Snyder et Hansen exhibited by *Lycopersicon pimpinellifolium* (Jusl.) Mill. and the tomato variety Pan America is localized in the root system, the scions of grafts of these two forms on susceptible stocks being susceptible.

1198. MACKIE, W. W. 635.652:575(73)
Mung beans . . . bonanza crop if you know their culture.
Sth. Seedsman 1945 : 8 : No. 1 : 22, 28, 44.

The cultivation and uses of the mung bean are described, with reference to the different varieties.

1199. WADE, B. L.,
HEINZE, P. H.,
KANAPAU, M. S. and
GAETJENS, C. F. 635.652:577.16:575.12
Inheritance of ascorbic acid content in snap beans.
J. Agric. Res. 1945 : 70 : 170-74.

A study has been made of variability in ascorbic acid content of the progeny of the cross U.S. No. 5 Refugee x Blue Lake and the reciprocal. Evidence was obtained that the quantity of ascorbic acid is a heritable character, showing transgressive segregation in the F_2 and subsequent generations.

1200. ELGUETA, M. and
BAILLON, L. 635.652:581.162.32
Ensayo de fecundación ajena en frejoles. (Test of cross fertilization in *Phaseolus*).
Agric. Tec. Chile 1944 : 4 : No. 1 : 38-40.

A plot of 5.40 x 45 m. was sown with alternative rows of the varieties Arroz, with red seeds, and Red Kidney with brown seeds, at a spacing of 10 x 40 cm. From 3925 plants of the variety Arroz only two bore pods with mottled brown seeds resulting from crossing. Thus there had been only 0.05% of out-pollination.

1201. LEBEDEFF, G. A. 635.652:581.6:575:581.02(73)
Inheritance of hard-shell in beans.
Genetics 1945 : 30 : 12-13. (Abst.).

Hard-shell in beans is an inherited character. Its expression, however, varies considerably with the environment, being greatly affected by the moisture content of the seed.

1202. SEEMANN, J. 635.652-2.111-1.521.6:578.08:575.42
Über die Bedeutung der Unterkühlung für die Selektion frostresistenter Bohnenpflanzen. (The significance of super-cooling for the selection of frost resistant bean plants).
Züchter 1942 : 14 : 258-64.

A suitable technique for determining the internal temperature of bean plants subjected to refrigeration experiments is described. This method has been found useful in selecting bean plants for resistance to low temperatures and has been used to show that the degree of cold resistance exhibited by beans is significantly correlated with the capacity of the tissues to undergo super-cooling without ice formation.

1203. ALLEN, D. I. 635.655:581.13
Differential growth response of certain varieties of soybeans to varied mineral nutrient conditions.

Res. Bull. Mo. Agric. Exp. Sta. 1943 : No. 361 : Pp. 43.

A study was made of the effect of varied concentrations in the nutrient solution of the chief essential elements upon the forage yields of the Morse and Virginia soya bean varieties.

1204. FUCHS, W. H. and
 SENGBUSCH, R. von 635.656:578.08:575
 Kleine Maschine zum Entpalen von grünen Erbsen für züchterische Zwecke.
(Small machine for shelling green peas for breeding purposes).
 Züchter 1942 : 14 : 285-89.

An apparatus is described, which, it is thought, should be useful for breeders who desire to make large scale investigations of the pod yield of green peas.

1205. HARE, W. W. and
 WALKER, J. C. 635.656-2.4-1.521.6(77.6)
***Ascochyta* diseases of canning pea.**

Res. Bull. Wis. Agric. Exp. Sta. 1944 : No. 150 : Pp. 31.

A study has been made of the life history of *Mycosphaerella pinodes* on peas under conditions in Wisconsin. Comparative studies have also been made of *M. pinodes*, *Ascochyta pinodella* and *A. Pisi*. Among the 3 varieties of peas tested no degree of tolerance was found which was sufficient for the practical purpose of disease control.

1206. MCNEW, G. L. 635.656-2.4-1.521.6:578.08:581.04
Which varieties of peas need treatment?
 Canner 1944 : 98 : No. 19 : 14, 16, 26, 28, 30.

Field tests on a considerable number of varieties have been carried out to determine the effect of seed treatment upon susceptibility to fungi producing seed decay, several different compounds being used. Highly susceptible stocks were found in all "sweet" varieties, regardless of the period required for maturity, although some strains were found to be fairly resistant. Crops from the Alaska type of seed were improved as a result of seed treatment.

1207. WALKER, J. C.,
 DELWICHE, E. J. and
 HARE, W. W. 635.656-2.484-1.521.6:575
A major gene for resistance to near-wilt in pea.
 Phytopathology 1944 : 34 : p. 1013. (Abst.).

All commercial varieties of pea resistant to wilt (*Fusarium oxysporum* Schl. f. *Pisi* race 1) are susceptible to near-wilt (*F. oxysporum* Schl. f. *Pisi* race 2). A degree of tolerance to near wilt has been secured by selection from certain varieties. Such resistance, however, is genetically complex and not easily fixed. In a single plant line from the cross between Admiral and Pride, neither of which is tolerant to near-wilt, a gene for complete resistance has been isolated which behaves as a dominant to near-wilt susceptibility. The F_3 progenies of a cross involving Wisconsin Perfection, which is resistant to wilt but highly susceptible to near wilt, fall closely into the ratio 1 resistant : 2 segregating : 1 susceptible. This line is to be used in the breeding of varieties combining desirable canning or garden qualities with resistance to both wilts.

1208. TSCHERMAK-SEYSENEGG, E. v. 635.658:581.6:575.12
 Untersuchungen zur Erklärung des Ertragsunterschiedes zwischen gross- und kleinsamigen Linsen und über Möglichkeiten, den Ertrag der gross-samigen Heller-Linsen zu steigern. **(Investigations to elucidate the differences in yield between large and small seeded lentils, and on the possibilities of increasing the yield of the large seeded Heller lentil).**
 Züchter 1944 : 16 : 1-3.

The larger yield of small seeded lentil has been shown to come about through the denser inflorescences, the larger average number of seeds per pod, and the heavier seeds of these forms. An account is given of the stem, seed and cotyledon pigmentation of lentil varieties and its significance for breeding purposes. The Heller lentil has been crossed with the Abyssinian form in order to combine the large seeded habit of the former with the dark orange seed colour of the

latter. It has been found that dark orange seeds tend to be associated with superior flavour. Difficulties were experienced, however, in obtaining satisfactory segregates, probably owing to the fact that seed size is determined polymerically. Some segregates with dark orange and medium-sized seeds were obtained and these were crossed with Puy linseed, a small seeded but heavily yielding variety. It appears, from an examination of the progenies of crosses between large and small seeded varieties, that large seeds and high yields are negatively correlated.

1209. MENEZES, O. B. DE 635.659:575(81)
Estudos para a genética do guando. (**Studies on the genetics of pigeon pea**).
Bol. Minist. Agric. Rio de J. 1943 : 32 : No. 10 : 69-83.

The species *Cajanus indicus* Spreng. is described and the history of its introduction into cultivation is briefly outlined. An account is given of the floral biology of the plant and of the method of artificial pollination. The correct chromosome number is regarded as $n = 11$ and not $n = 9$ as reported by Basudev.

The plant grows extensively in a semi-wild state in the Baixada zones and a study is being made of these plants, as representing potentially valuable forms for breeding purposes.

1210. MENEZES, O. B. DE 635.659-1.543(81)
Estudos para o melhoramento do guando—espaçamento e competição de variedades. (**Studies on breeding pigeon peas; spacing and competition of varieties**).
Rev. Agric. Piracicaba 1944 : 19 : 399-412.

The different varieties studied reacted differently to alterations in spacing.

1211. PICKETT, B. S. 635.67:575(76.4)
Sho' nuf Dixie sweet corn.
Sth. Seedsman 1944 : 7 : No. 12 : 15, 40.

The hybrids Texas inbred 36122 x I 45 (a parent of Ioana) and Illinois Golden Hybrid No. 10 are briefly described, and compared with the older varieties Ioana and Iogold A. The new hybrid 36122 x I 45 shows complete resistance to earworm. One undesirable character is its unusually numerous silks.

1212. HABER, E. S. 635.67:575.125
New sweet corn hybrids for canners.
Fm Sci. Reporter, Iowa 1945 : 6 : p. 24.

Iogreen 56, Iogreen 16 and Iogent 11 are new white sweet corn hybrids adapted to conditions in Iowa. Iogreen 56 is a medium late maturing hybrid which has an average of 18-26 rows of grain and a fairly high resistance to smut. The ears taper slightly from base to tip. Iogreen 16 is similar to Iogreen 56, but the ear does not taper and its row number is smaller. Iogent 11 yields $\frac{1}{2}$ ton more per acre than Iogent 27.

1213. ANDREW, R. H.,
BRINK, R. A. and
NEAL, N. P. 635.67:581.48:581.6:575.11
Some effects of the waxy and sugary genes on endosperm development in maize.
J. Agric. Res. 1944 : 69 : 355-71.

The effect was investigated of two pairs of alleles, waxy *wx* and non-waxy (*Wx*) and sugary (*su*) and non-sugary (*Su*), upon the following storage qualities of the endosperm of sweet corn: moisture content, carbohydrate content, weight and morphology of the kernel; pericarp tenderness as measured by resistance to puncture, and canning quality. Four types of pollen, *Su Wx*, *su Wx*, *Su wx* and *su wx*, were applied under similar environmental conditions to *su wx* plants. Studies confirm earlier work, showing that sugary endosperms contain a greater amount of water-soluble polysaccharides than non-sugary endosperms. The presence of the waxy gene in sweet maize further increases the percentage of the water-soluble fraction. The effects of the sugary and waxy genes are not confined to synthesis of carbohydrate reserves in the endosperm. The sugary kernels lose their moisture less rapidly with advancing maturity, and within the sugary and non-sugary classes waxy kernels generally show greater percentages of moisture than non-waxy kernels. At maturity non-sugary kernels have a greater dry weight than sugary kernels.

With respect to resistance to puncture different kernel types fall into two distinct classes, the resistance of the starchy kernels increasing much more rapidly with maturity than that of sugary kernels. The sugary gene when homozygous greatly reduces the resistance to puncture by modifying the nature and compactness of reserves in the endosperm cells. The pericarps, however, which are genotypically alike, give differences in resistance when peeled off and punctured, those from non-sugary kernels being more resistant than those from sugary kernels. No significant differences in toughness were observed between waxy and non-waxy kernels within the sugary and non-sugary classes.

Canning trials made at three stages of development indicate that neither of the starchy endosperms, *Su Wx* and *Su wx*, give desirable products. The waxy gene was found to delay the optimum canning stage for a day without increasing the duration of the canning stage.

1214.

635.8:575.148

635.8:577.8

635.8:575.242

KLUSCHNIKOVA, E. S.

(The experimental and cytological study of the bisporous form of *Psalliota campestris* Fr.)

Učenyje Zapiski Moskovskogo Gosudarstvennogo Universiteta. Trudy Instituta Botaniki (Scientific Proceedings of the Moscow State University.

Transactions of the Institute of Botany) 1940 : 36 : 136-71.

An account is given of mushroom cultivation in the U.S.S.R., together with a detailed review of the experimental work published in other countries.

Experiments were made on culturing the mycelium on various artificial media. Detailed observations on the fructifications showed that within each of the three main varieties white, cream and tawny there were variations in shape and form of the head and stalk. Attempts were made to isolate these different forms in a genetically pure state by single spore cultures of sterile mycelia. Three pure cultures were isolated, namely white with smooth skin, white with scaly skin, and brown; 100 kg. of spawn in a sterile state was furnished to the Marfino collective farm for planting in 1933. The crop produced proved more vigorous than that from ordinary commercial spawn, was morphologically uniform and gave a higher yield. It was impossible to attain such uniformity by mycelial selection. The tawny variety bred true for three consecutive spore generations; the smooth white and the cream varieties however were less stable and in the second and third spore generations produced a number of tawny forms, even when grown in pure culture.

The literature on heterothallism in the Hymenomycetes is reviewed in some detail. It is shown that diploidization may come about in many different ways, and bipolar, tetrapolar and multipolar systems of heterothallism, as well as graded sexuality, exist. In view of the bisporous basidia of the cultivated *Psalliota campestris*, the position is somewhat different and requires further elucidation. Some 70 single spore clones were cultured and full descriptions and illustrations are given of the germination of the spores and the development of the mycelia. No abnormalities were observed in the development of the mycelium from a single spore. The mycelia from the single spore clones were brought together in all possible combinations. This produced no detectable alterations in the mycelium and after about three months (as against the normal period of two months), fructifications were produced from both the mixed and unmixed cultures. Cytological examination of the hymenial layer showed it to be binuclear; the mature spores contained four nuclei and the germ tube several. This leads to the conclusion that the form in question is homothallic. The origin of the tawny forms among cultures of the white form must therefore, it is thought, have been due either to mutation or chimaera formation.

BOOK REVIEWS

Hiss, P. H.

016(72.9)

A selective guide to the English literature on the Netherlands West Indies with a supplement on British Guiana.

Netherlands Information Bureau, New York City 1943 : Booklet No. 9 :

Pp. xiii + 129.

In this booklet the author points out the difficulties of compiling a bibliography of English literature on a country whose native tongue is not English, but, allowing for the inevitable disproportion which must result from this handicap, the field covered must be regarded as both wide and varied. The table of contents includes: general works, government publications, history and archaeology, government, missions, politics, law, social conditions, economy (comprising sections on agriculture and forestry), anthropology, geography, science (represented by short sections on natural history, geology, climatology, navigation, medicine and hygiene), languages and literature, and World Wars I and II.

No comprehensive bibliography on the subject had so far been attempted and the present work provides a key to the extensive English literature of Curaçao and Surinam.

The supplement on British Guiana follows the same general classification, and, like the larger sections on Curaçao and Surinam, contains a number of very early works in addition to the more modern literature of the subject.

A biographical note on the author and an author index complete this well-produced publication of the Netherlands Information Bureau in New York.

06:633

Sveriges Lantbruksförbund. Årsbok 1944. (Swedish Agricultural Union. **Yearbook 1944**).

Lantbruksförbundets Tidskriftsaktiebolag Stockholm 1944 : 3.25 kronor: Pp. 272. 27 tables. Illus.

In this yearbook, the first of the series, information will be found about the origin of the Union (from the Swedish General Agricultural Society) and its aims, and economic conditions, and especially agricultural conditions, in Sweden, where the Agricultural Union movement is developing and an Agricultural Union School has now been established. The work of the Union and its future possibilities are presented in a series of articles covering many aspects of agricultural and economic life, e.g. the national food supply (including the dairy industry, livestock rearing and oil plant production), fuel, labour, prices, government regulations, instruction work, finance, building and advertising.

An appendix gives statistical information on Swedish agriculture and its various subsidiary Unions, including lists of members and addresses.

The booklet has been excellently produced and is well illustrated and should find many readers in countries that are able to choose the voluntary system of agricultural co-operation which the Scandinavians devised so long ago, and which, in Sweden, has stood the test of world conditions during the worst war history has so far known.

JAEGER, E. C.

57:001.4

A source-book of biological names and terms.

Charles C. Thomas, Springfield, Illinois; Baltimore, Maryland 1944 : \$3.50.

Pp. xxvi + 256. 96 figs.

Unbalanced enthusiasms and narrow-sighted judgments are, unfortunately, as rife to-day as in any period of recent history. Especially is this the case in the rapidly developing field of the natural sciences, where acclamation of new ideas may be as immoderate as the conservatism which opposes their introduction. Science and Letters are to-day but loosely linked, as evidenced by the notoriously stilted style of scientific papers and, on the other hand, the resentful attitude of so many classicists and men of letters to scientific advance. Yet this discordance is in all respects regrettable, since language is the instrument of thought and the medium of self-expression. If the *litterateur* shrinks from science and the scientist exults in his barbarism, those seeking a balanced *Weltanschauung*, that is, a scientific humanism, will be forced to dissociate themselves from either side.

*"Igitur quisquis vera requirit,
neutro est habitu . . ."*

Botanists, above all others, should feel the present position most keenly. The liaison between botany and letters, which began so auspiciously with Theophrastus, Dioscorides, Pliny and Virgil, lasted long; the flexible vocabulary of the later Latin authors became the accepted medium for the exchange of botanical ideas, a happy arrangement which was only upset by the retrogressive nationalisms of the post-Renaissance period; and even to-day the International Rules of Botanical Nomenclature require that diagnoses of new species should be set out in the only language that has been or seems likely to be an international auxiliary.

In the present day, therefore, there is no person more favoured in the attempt to cultivate scientific humanism than the botanist with a love of literature and philosophy. Yet the typical gamut of scientific education allows little space for the appreciation of other values, and the process of integration is therefore not easy. The book under review is, however, a welcome contribution to this end. Biological nomenclature, deriving from the richly Graecized Latin of the Middle Ages, is an epitome of classical allusions, including also late Latin and Arabic elements. Investigation into the etymology of biological terms is a humanizing study and one of such complexity that much more than a knowledge of classical Greek and Latin is necessary. Biological Latin has its own traditions, for example a preference for the spelling *laevis* instead of *levis*, and its various conventions regarding capitalization. Only a scholar well acquainted both with classical and biological literature could hope to compile a satisfactory source book of biological terms, and the author is to be complimented both for his decision to attempt such a task and for the manner in which he has achieved it. Every effort has been made to reduce the difficulties of a consultant unacquainted with Latin or Greek, and it is to be hoped that the information so gained will act as a stimulus to further enquiry.

In his introduction into the general principles of word formation, the author is guided largely by the recommendations of the International Rules of Botanical Nomenclature, which, although most enlightened on many topics, do unfortunately condone bad etymology and sacrifice points of verbal elegance to considerations of priority. They also recommend the barbarous custom of Latinizing personal names, merely by suffixing the syllable *-ius*. Consequently, we are shocked daily to encounter such apparitions as Brownius, Gibbsius, Juzepczukius and Schweinitzius. It is of course almost impossible to avoid all minor errors in such a comprehensive work, but it is worth pointing out that there is no satisfactory evidence to support the derivation of the word "sepal" from the Greek *σκέπη*. Necker, who introduced this term in 1790, defined it as "pars exterior interiorque perigynandae propriae, generationis organa vegetabilium, sexusve plantarum circumdans". It is probably no more than a rhyming analogue of "petal".

The publishers are to be congratulated on the production of an elegantly printed book which is clearly set out and well bound.

BOERGER, A.

575:633(82)

Investigaciones Agronómicas. (**Agronomic Research**).

El Ateneo, Buenos Aires 1943 : Vol. I : Pp. 758; Vol. II : Pp. 1043; Vol. III :

Pp. 443 : 100 pesos. 112 tables. 71 figs.

One of the most significant developments of the present century has been the institution and fostering of scientific research in the Latin American countries. Because such events exert but a gradual effect, they tend to pass unnoticed by contemporary writers, but there can be little doubt that the scientific exploitation of the natural resources of South America will have a most profound effect on world economy when its fruits begin to appear.

Professor Boerger's comprehensive work will be welcomed by all those who wish to ascertain for themselves the volume and scope of agronomic research in Uruguay. There are three parts to be considered, an introductory volume on fundamental principles, a second volume on the genetics and agronomy of crop plants, and a final volume on sociological and economic problems.

In the introductory volume, the author's twin bent, both philosophical and scientific, is brought out clearly. An admirable review is given of the philosophy of scientific method and of the relations between theology, philosophy and science. The empirical method of scientific investigation is considered and contrasted with the speculative, and both these methods of approach are in turn discussed in relation to the personal element contributed by the experimenter himself. In all these questions, the humanist bias of the author is apparent, and there is a delightful collation of authors as diverse as St Augustine, Cervantes, Kant, Goethe, Darwin, Ramón y Cajal, Planck and Bertrand Russell. It would be no exaggeration to claim that the author's breadth of view compares very favourably with that of his contemporaries in many English-speaking research institutions.

The remainder of volume one deals with the following topics: the soil types of Uruguay, the climate and its effect on plant growth, the production and economics of crop plants, agricultural methods, fertilizers and manures, and weeds, pests and diseases.

Volume two will be of most immediate interest to plant breeders. True to his logical method of approach, the author commences with a general account of genetical theory, the nature of life, and the various controversies surrounding these topics. The application of genetics to breeding is then discussed, special attention being paid to methods of selection, and the genetics of disease resistance and chemical quality, and this is followed by a description of the organization of plant breeding in Argentina, Rio Grande do Sul and Uruguay. Details are given in the remainder of this volume of the varieties, genetics and agronomy of wheat, maize, oats, barley, rice, linseed, sunflower, ground-nut, soya bean, cow-pea, bean, lentil, pea, potato, leguminous forage plants, forage grasses, and other minor crop plants.

The third volume discusses the sociological and economic problems related to crop production, and here again the philosophical attitude of the author is conspicuous. There is a useful appendix listing the publications of the La Estanzuela institute of Uruguay and the whole work is well indexed. The three volumes are well printed and illustrated and pleasant to read, and may be cordially recommended to all those interested in the agricultural achievements and projects of Latin America.

CLAUSEN, J.,

KECK, D. D. and

HIESEY, W. M.

576.12:576.356.5:582

Experimental studies on the nature of species. II. Plant evolution through amphidiploidy and autopoloidy, with examples from the Madiinae.

Carnegie Institution of Washington, D.C. 1945: Publication No. 564:

Pp. vii + 174. 86 figs. 14 tables.

The first part of this book deals in detail with three synthetic amphidiploids in *Madia* and *Layia* (Compositae). These form interesting examples. Two appeared successful, but the third showed segregation and reduced fertility owing to the presence of pairing between the parental genomes.

The remainder of the book comprises a general discussion of the importance of auto- and allopolyploidy in nature, including a critical examination of a large number of known cases (synthetic and naturally occurring) of each. Many of these examples involve economic plants including cases in *Fragaria*, *Phleum*, *Triticum*—*Secale*—*Aegilops*—*Haynaldia*, *Brassica*, *Gossypium*, *Nicotiana*, *Solanum*, *Lactuca*, *Prunus*, *Rubus*, *Zea* and *Dactylis*. These examples are very clearly and concisely dealt with and will in themselves be of considerable interest to the plant breeder.

The authors attempt to make clear the distinction between auto- and allopolyploids (or, as they term them, autopoloids and amphiploids), which has been the subject of much confusion. Mere hybridity of origin is not to be regarded as a criterion. Cases are known where recognized taxonomic species have been crossed and have yielded a fertile hybrid, which has subsequently had its chromosome number doubled. This is essentially an autopolyploid and the parent types were really ecotypes or varieties of a single ecospecies. The real distinction between autopolyploids and allopolyploids is not sharp. It is shown that, on the whole, the most successful polyploids either have four (or eight) completely interchangeable sets of chromosomes (true autopolyploids), or chromosome complements containing only two chromosomes of each kind, where very little or no irregular pairing occurs (extreme allopolyploids). Intermediate cases, in which there is a good deal of illegitimate chromosome pairing, are mostly doomed to failure. The bearing of recently acquired cytogenetic knowledge on systematic botany and our knowledge of the processes of evolution is discussed at length. In doing this, the authors recognize four systematic units, the ecotype, ecospecies, coenospecies (after Turesson) and comparium (after Danser), the latter including "all the coenospecies between which hybridization is possible either directly or through intermediaries". If this classification is adopted by taxonomists, it is pointed out that considerable changes will be necessary in certain families, e.g. *Triticum*, *Aegilops*, *Agropyron*, *Haynaldia*, *Secale*, *Elymus*, *Hordeum* and *Sitanion* will be brought together as a single comparium, as will *Lolium* and *Festuca*. A more glaring example is *Saccharum* and *Bambusa*.

This method of classification fits in more closely with real plant relationships and evolutionary trends than the older system of taxonomical pigeon-holing. On the other hand, it is likely to lead to its own special difficulties. The authors take into account purely artificial allopolyploids in determining the status of groups. Many of these would not have arisen or, more important, could not have survived in nature. Clearly such an approach is necessary to a certain extent, since many closely related species do not occur together in nature and hence can only be crossed experimentally. On the other hand, it means that our classificatory system is likely to vary substantially as our skill in making crosses increases, e.g. by methods of embryo culture in nutrient media, or by special pollination techniques. Another feature which seems confusing is the naming of a coenospecies after the first-named constituent ecospecies, so that the same Latin combination comes to mean two distinct entities, and it is necessary to state each time which is meant.

The course of evolution in plant groups is traced through its various stages. It is considered that in the early stages of the development of a group polyploidy will be of little account, since nearly related ecospecies do not give stable and successful allopolyploids. Only when distinct coenospecies, with marked genetic barriers, have arisen does polyploidy come into the picture as an important feature of evolutionary development.

Another interesting conclusion is that auto- or allopolyploidy "may shift the genic balance, thus permitting the plant to invade new environments. It does not, however, appear to force adaptation predominantly toward either severer or milder conditions than those of the place of origin".

S. E.

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63.00.15(47)

(General Assembly of the Academy of Sciences of the U.S.S.R. held on 25th to 30th September of 1943).

Academy of Sciences, U.S.S.R., Moscow-Leningrad 1944 : Pp. 246.

This is a *verbatim* report of the session held in Moscow in September 1943. The volume contains, in addition to other relevant matter, 16 papers covering various activities of the Academy and its scientists for a period of 18 months.

Researches are mentioned, among several others, under section six in "A report of the scientific activities of the Academy of Sciences of the U.S.S.R. for 1942 and the first half of 1943" presented by N. G. Bruevič, which may be of interest to plant-breeders. These are "Heredity and Variability" [Institute of Genetics], "The Principles of Plant Evolution" [Moscow Botanical Garden], and "A Course in Darwinism" [Institute of Evolutionary Morphology].

A short survey of the most urgent problems with which the Academy is faced in wartime is given by A. A. Baikov in the paper, "The main features of the 1944 plan of work of the Academy of Sciences of the U.S.S.R." The necessity for co-ordination in the work of the 114 academicians, 168 corresponding members and some 5000 scientific workers is stressed, and tentative proposals are made with this end in view. Among the problems proposed for biological research are (1) an increase of yields of farm and technical crops and (2) problems of Darwinism.

DAHLGREN, B. E. and

STANDLEY, P. C.

633(72)

Edible and poisonous plants of the Caribbean region.

Bureau of Medicine and Surgery, U.S. Navy Dep., Washington, D.C. 1944 :

Pp. iv + 102. 20 cents. 72 illus. tables.

This illustrated manual describes the common edible and poisonous plants of the Caribbean region, chiefly of Central America and the West Indies. Designed primarily for the serviceman in the event of being separated from his unit, it provides simple tables for the ready identification of wild and cultivated fruits such as the avocado, mamey, sapodilla, cultivated roots such as cassava, dasheen, otó, and various seeds, leaves and flowers, which can be used as food in an emergency. Equally concise guidance is given for the identification of the poisonous plants likely to be encountered. The description of each species includes useful information of native uses and names.

* An extended review of this volume is on file at the Bureau.

GUŠČIN, G. G.

633.18

(Rice).

State Publishing House of Kolhoz and Sovhoz Literature ("Seljhozgiz")
Moscow 1938 : Pp. 832.

Of the 20 species comprising the genus, *Oryza* L., 12 belong to the *sativa* section which includes the wild rice, *O. sativa spontanea*, the most widespread and the most diversified in form, and, like *O. officinalis* Wall., forming one of the main constituents of cultivated rice, to which, it is believed, also other species have contributed their characters.

To the plant breeder, rice offers a wealth of characters from which to choose those which will enable rice cultivation to extend beyond the 50° latitude north, and 26° latitude south which it has reached at present. Other characters which it is important for it to possess are such as will prevent lodging and shedding of the grain. It must, furthermore, ripen early, yield abundantly, have few or no awns, be tall enough to facilitate harvesting by machinery, and grow without the standing water which, though hitherto unavoidable in many rice districts, does not answer to the optimal needs of the plant. The technique of breeding is fully described in Chapter X, and the inheritance of characters in Chapter V.

The birth place of rice cultivation is Bengal and the slopes of the Himalayas upon which the rain of the monsoons falls in abundance. It was not until man acquired skill in controlling the flow of water by means of irrigation, that he could render the rice crop independent of direct rainfall and enable it to be grown down in the river valleys and deltas. Weeds, however, became a serious problem, and irrigation water came to be used as a means of combating them with only partial success and to the detriment of the crop.

I. Z.

634:578.08

Answers to growers.John Innes Horticultural Institution London [Undated] : Bull. No. 1 : Pp. 60 :
2s. 6d. : 15 figs. 26 tables.

Horticulture is one of the oldest crafts now in existence and has been studied and improved from very early times. Yet its progress has been largely conditioned by traditional practices which have been passed on little altered from one generation to another. Sometimes, of course, these practices are seen on closer scrutiny to represent the most efficient method of achieving the desired results, but quite frequently the converse holds and tradition is seen to be an obstacle to maximum efficiency.

It is only in quite recent times that a thorough scientific approach has been made to such problems, a field in which the John Innes Horticultural Institute has been conspicuous. In this bulletin, a simple and concise account is given of experiments relating to such common practices as hoeing, composting, rearing of seedlings, leaf-mould utilization, soil sterilization and methods of greenhouse heating. These practices have been studied scientifically and their utility ascertained statistically by comparative trials; the conclusions reached will probably come as a surprise to many fruit producers.

The latter part of the bulletin deals with varieties, presenting information on such crops as hybrid sweet corn, dwarf and bush tomatoes and plums. The causes of the aberrant behaviour recently reported in scions of the apple variety Lord Lambourne are discussed, also the problem of red spider infestation.

Such a diverse collection of miscellaneous information should be most useful to all fruit growers. The bulletin is well set out and plentifully illustrated.

ENGARD, C. J.

634.71:581.4

Organogenesis in *Rubus*.University of Hawaii, Honolulu 1944 : Res. Publ. No. 21 : Pp. xvi + 234. 448
figs. 3 tables.

The revitalization of the science of plant morphology has been one of the most significant trends in recent botanical research, dealing as it does with the fundamental and recalcitrant problem of the development and nature of plant form. Early investigators did much towards collecting and systematizing morphological information, but they did so labouring under the handicap of a defective philosophical outlook. The tendency of early morphologists, which is inherited by most current botanical text-books and even by many present-day research workers, was towards the establishment of a number of morphological categories, such as root, stem, leaf, cortex,

pericycle and vessel, into which all the diversity of plant structure had to be forced. Structures as dissimilar as cotyledons and carpels, which happened to land up in the same pigeon-hole, in this case labelled "leaf", were then described as related by the bond of "homology". Such a naive approach, which has characterized botanical research since the time of Aristotle, certainly panders to one of the besetting weaknesses of the human mind, which derives satisfaction from mere classification however arbitrary. A more adequate approach, foreshadowed by Hamshaw Thomas' paper on the "new morphology", in which the commonly accepted morphological categories are subjected to a searching analysis, is only just beginning to emerge. The introduction of a new morphology, in which a study of the relations between adequately defined characteristics replaces the old morphology of arbitrary categories, is a *sine qua non* for the adequate development of plant morphology.

Professor Engard's monograph will certainly contribute to this end. It is seldom realized how ignorant we are of the simplest morphological facts concerning frequently investigated species. In this publication, a detailed account is given of the ontogeny and morphology of the shoots, roots, cataphylls, leaves and floral axes of four species of *Rubus*. It is interesting to learn that the protoxylem of this genus appears to consist only of tracheids, and that the annular thickening of these elements may arise secondarily by the extension, breaking and subsequent joining of single turns of the primary spiral thickening. The information given of the ontogeny of the vascular system is perhaps the most valuable contribution of the book and this is accompanied by a consideration of the fundamental morphological categories involved.

A final chapter considers the problem of deciding whether two organs are *sui generis* or homologous. The method of approach is stimulating, containing sympathetic reference to Goethe's theory of metamorphosis and applying the ontogenetic concept of the "field". It is difficult to avoid the conclusion, however, that the analysis is not sufficiently stringent. It is stated with full justification that the problem of homology is at root philosophical, but no adequate attempt is made to define the meaning of this concept. Moreover, it is claimed that nobody would deny that the shoot and root are each *sui generis*, which is an ambiguous claim, for it is quite possible to maintain that shoot and root are homologous although to a degree more remote than, for example, leaf and cataphyll. A more flexible approach, based on the realization that organic similarity and dissimilarity admit of degrees and are therefore to be expressed in relative terms would have enhanced the value of this excursus.

The monograph is, none the less, a model morphological treatise, combining as it does a rich selection of factual information, extremely good and copious figures, and a proper consideration of the significance underlying the observed data.

HOLDRIDGE, L. R.

634.97:582(72.95)

Trees of Puerto Rico.

Occ. Pap. For. Serv. U.S. Dep. Agric. 1942 : Vol. I : No. 1 : Pp. 105; Vol. II : No. 2 : Pp. 105.

One of the most pressing requirements to-day of those concerned with tropical botany is the production of reliable local floras. The spate of research into the systematics of tropical plants and the publication of the results of such work in journals not generally available creates serious difficulties in the way of scientific workers who need information on floristics. In addition, the labours of the nomenclaturists have complicated the tasks of reference as they have led to the throwing over of many terms of long standing.

When, therefore, steps towards the publication of a local flora are taken in such a capable manner as distinguishes the preparation of the two volumes under consideration, the gratitude of all those interested in the botany of the West Indies will be earned. One hundred tree species are covered in this compilation, each admirably figured and described succinctly and simply. The due mention of vegetative characters of diagnostic importance is an example which might well be followed elsewhere. The general lay-out of the flora is good and the arrangement whereby the figures and descriptions of each species lie on opposite pages most helpful. Engler's system is followed for arranging the species, and in addition to the botanical descriptions, accounts are given of the geographical distributions of the various trees, their vernacular names and their economic uses; a glossary of technical terms is appended to each volume.

The author and his collaborators are to be congratulated on the excellence of their production, the completion of which will be awaited with keen expectation.

BURKART, A. 635.65(82)
Las Leguminosas argentinas silvestres y cultivadas. (**The wild and
cultivated Argentine Leguminosae**).
Acme Agency, Buenos Aires 1943 : \$20.00. Pp. xix + 590. 123 figs. illus.
tables.

The state of botanical and agricultural knowledge is at the present day so far advanced in those families of plants whose species possess wide economic applications that only the specialist is in a position to treat them at all adequately. The economic value of the Leguminosae, coupled with the great size of the family, renders it even more essential in a large country that stretches over at least one third of a continent that a monograph should be attempted only by the specialist who has devoted many years to its study. Dr Burkart has been engaged for the last fifteen years in the investigation of the Argentine Leguminosae and has now produced the admirable book under review.

Whilst in a work of this type the systematic portions will obviously occupy most of the space, nevertheless the author has been able to include chapters on morphology, physiology, phylogeny, domestication of species, ecology, and economic applications.

The taxonomic portion of the work is supplied with seemingly adequate dichotomous keys and descriptions of subfamilies, tribes, genera and species. The species descriptions are for the most part, however, confined to the economically important species, though short notes are also given on the wild and ornamental forms. Although, as the title of the book implies, only Argentine genera and species are touched upon the author makes it clear that its scope actually includes all the Uruguayan genera, together with a large part of those found in south Brazil, Paraguay, Bolivia and Chile, whilst the three small Chilean genera that do not spread into Argentina are also included, so that the book may be used as a monograph for the Leguminosae of Chile also.

In addition to the keys to genera and species that are found throughout the book and which are based on natural affinities, the author gives at the end a very complete key to the species based on the characters of the seeds.

The work is profusely illustrated with photographs and line drawings of a typical species in each genus; detailed drawings of the seeds are also to be found in the final chapter; these latter plates are to be used in connexion with the artificial key.

J. G. H.

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